House of Commons

Innovation, Universities, Science and Skills Committee

Putting Science and Engineering at the Heart of Government Policy

Eighth Report of Session 2008–09

Volume II

Oral and written evidence

Ordered by The House of Commons
to be printed 8 July 2009

HC 168-II
Published on 23 July 2009
by authority of the House of Commons
London: The Stationery Office Limited
£0.00

The Innovation, Universities, Science & Skills Committee

The Innovation, Universities, Science & Skills Committee is appointed by the House of Commons to examine the expenditure, administration and policy of the Department for Innovation, Universities and Skills.

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Witnesses

List of written evidence

Oral evidence

Taken before the Innovation, Universities, Science & Skills Committee on Monday 26 January 2009

Members present:

Mr Phil Willis, in the Chair

Dr Ian Gibson
Dr Evan Harris
Mr Gordon Marsden
Ian Stewart
Graham Stringer

Witnesses: **Rt Hon Lord Drayson,** a Member of the House of Lords, Minister of State for Science and Innovation, **Dr Graeme Reid,** Head of Economic Impact, Science & Research Group, and **Mr Jeremy Clayton,** Deputy Head, Government Office for Science, gave evidence.

Q1 Chairman: Could I welcome in particular this afternoon to this very first session of the new inquiry, Putting Science and Engineering at the Heart of Government Policy, Lord Drayson of Kensington, the Minister for Science and Innovation at DIUS. Welcome to you, Minister.
Lord Drayson: Thank you.

Q2 Chairman: Graeme Reid, the head of economic impact of the Science & Research Group at DIUS, welcome to you again, Graeme, it is nice to see you in the new year; and Jeremy Clayton, another old friend of the committee, the deputy head of the Government Office for Science at DIUS, welcome to you as well, Jeremy. Could I just say by way of introduction that this particular inquiry really sort of builds on, I think, three pieces of work which the committee and its predecessor have done. First of all, in terms of the engineering inquiry we have just virtually completed, we ran a small case study which was looking at engineering in government, and there were some very, very interesting comments brought forward during that particular session. Secondly was during the science budget allocations, again, there was some real concern by the committee, and indeed one of the drivers for this inquiry was what is the juxtaposition between national science policy and policy within the regions. The whole issue of the Haldane principle again came up during that inquiry, which was repeated by Wakeham's review of physics. Our predecessor committee did a major piece of work about scientific advice to government in the formulation of policy, and again, that is a theme which is running through our committee's work, which is really about evidence-based policy, so that is the background to it. But I wonder if I could start, Minister, by saying that your role differs very significantly from your immediate predecessor's, and indeed, going back to Lord Sainsbury, from his role as well, and I just wonder how you are using your upgraded position with a role within the Cabinet as well to put science and engineering at the heart of government. Do you see it in those terms?
Lord Drayson: Yes, Chairman, absolutely. I see my role as to be a champion for science and engineering through government, that is through the promotion of the research base, the promotion of excellence in research, but to do that not just through my responsibilities in my own department, but using the fact that I have been given the task of setting up this brand new committee for science and innovation to make sure that science is put at the heart of government policy. We have the second meeting of the committee tomorrow, so we have had one meeting so far, but I would say that just from the initial feedback from that first meeting with my ministerial colleagues and other government departments, there is a shared recognition across government of the central importance of science, the importance of making sure that policy is based around good science, and the importance of ensuring that government departments have access to the necessary expertise, the R&D budgets to make sure that policies which they develop and implement are consistent with policies which are being implemented in other parts of government, and to make sure that it adds up to a coherent whole which positions the UK to capitalise on, I think, its brilliant track record in science, to make sure that that science is pulled through effectively into wealth creation.

Q3 Dr Gibson: The fact that you say that it should be at the heart of policy decisions and so on kind of suggests it never has been. Are there evil forces around who believe that it might not be the right place for science to be, at the heart, but more on the periphery; do you pick that up?
Lord Drayson: I think that there are examples of real excellence, but there are also examples where science is not properly recognised, and the role of science, particularly early on in the development of policy, and that is something which we need to work on. I think the recognition of that mixed picture is why I have been appointed to this role, why this role has been structured in this way. My brief really is to make sure that good practice which does exist is taken across other areas of government, so departments learn from each other, and I see my role as to use both persuasion, exhortation, balanced argument, to persuade—

Q4 Dr Gibson: Vehemence.
Lord Drayson: And vehemence, and a bit of passion as well, to make sure that all government departments raise their game on this, and there is

never a more important time to do it. I feel that the current economic environment actually provides a real focus on this, and the response from government departments in that first meeting, I would say, has been really positive. There is a recognition of the importance of this.

Q5 Chairman: Just following on from Ian Gibson's question there, it is an incredibly confusing picture of science in government, you know, with some departments having chief scientific advisors and others not having them; the sub-committees for science and innovation report to Cabinet through a committee that considers economics; you have a number of government departments that have established science advisory councils, and others have not. For instance, DIUS, the department you sit in, does not have one. What is all that about? How do you get some real sense of collective responsibility for science right across government, or is that your job now?
Lord Drayson: That is my job. I think that I am actively promoting the development of coherence, a policy of making sure that these activities the different departments are taking and the support structures that exist have synergy between them, that they are effective in working together. One of the most important aspects of this area for me is that many of the policy areas require more than one department to work together; there are a number of really quite important science projects, of strategic importance for the country, which you cannot just easily put into one particular government department. Therefore, we need to develop effective mechanisms whereby multiple departments can work together, not get embedded in their own silos, to share information and focus around a particular area. I think climate change is an area where we are going to see this being increasingly important, as an example.

Q6 Chairman: But if science is so important, you are a zealot in terms of the way in which science and engineering can affect this country's future, how can it be possible that major departments, like Treasury, for instance, do not even have a departmental chief scientific adviser? Until recently, Education did not. How is that possible, and what are you going to do about it?
Lord Drayson: I am going to strongly encourage them to change that. I think we should recognise that UK has been a real leader in terms of international governments in the way in which it has developed scientific advisors within government departments. Many countries in Europe do not have any at all. So what we need to do is raise the game of those departments which do not have science as a central part of their policy development, and its implementation, and I think that is a combination of me being a zealot, as you say, but also pointing out to departments the benefits. Part of it is breaking down some prejudice about what science is, so that where you may have pockets of people saying, "We do not do science in this area", pointing out to them that they may not think they are doing science when they are working on this particular area, for example, in particular, like a social science, they may not think about the scientific method as a way of development of policy, but there are real areas of relevance. Part of my job I see as just not accepting the easy, "We do not do that"; I go back and say, "Well, let us go through this, let us see how we can change the way in which you are doing things".

Q7 Chairman: But Minister, the sub-committee for science and innovation which you head up does not have representatives from all the departments, nor does it have the government chief scientific adviser sitting on it.
Lord Drayson: Yes, it does. It does have the government's chief scientific adviser.
Mr Clayton: I think the formal position is that Cabinet committees consist of Ministers. For this particular committee, as with some others, there is a line at the bottom which says the government chief scientific adviser is invited to attend, so as a matter of course he does attend and take part in the discussion. I think he may not be a formal member.

Q8 Dr Gibson: Scientists work in teams, they move in groups of people, fielding ideas and so on, working together across science and so on. What do you think about civil servants in this area? I think they have quite a bit of clout, do they not, in areas? You can have all the ministers you like in the world, you can have a scientific adviser, but at the end of the day, civil servants can put the boot in quite hard. Is that true, in your experience so far?
Lord Drayson: I think civil servants have a major contribution to make, and therefore it is very important that we have enough scientists and engineers in our Civil Service. When I was a defence minister, I was very active in the development of the cadre of scientists and engineer civil servants within the department, and one of the things I learnt in doing that was the lack within our current Civil Service career structure for a parallel career path for civil servants to develop their careers and stay in the specialist area of science and engineering. You can do it in certain other professional areas, I am very keen to encourage the Civil Service to develop this for the science and engineering profession. That has been developed very successfully, particularly in the hi-tech industry, in the private sector. We have to have a situation where to get promoted within the Civil Service, you do not necessarily have to switch from being a specialist engineer to being a generalist. That is certainly the structure which exists in best practice in industry, and it is one which we need to develop in the Civil Service. I was very pleased to see your committee chairman ask for returns from departments on the numbers of graduate scientists and engineers in each department; I was very disappointed by the returns that came back. We have to change this.

Q9 Ian Stewart: It is interesting that you have mentioned engineers several times in the same breath as scientists. Do you therefore see yourself, when you have got this cross cutting role, as minister for science, engineering and innovation?
Lord Drayson: Yes.

Q10 Ian Stewart: So you very much see yourself as that?
Lord Drayson: Yes, in terms of championing the science profession within government and the engineering profession within government, and taking specific action already: the government chief scientific adviser has set up a professional group for scientists and engineers, he set up the first meeting last week, he invited me to come and give a talk to that meeting, it was an enormously effective gathering, the head of the Civil Service came and spoke too. So I think what we are doing is developing a sense of the science and engineering profession within the Civil Service, this is something which we need to continue and we need to develop it. We do need more scientists and engineers in the Civil Service.

Q11 Chairman: Lord Drayson, CST was clearly set up by the former Prime Minister, Tony Blair, as being a really important organisation, sort of driving science, innovation, technology, with some incredibly eminent scientists, engineers, technologists and economists on board. The Prime Minister met regularly with that organisation. Do you meet regularly with that organisation?
Lord Drayson: Yes, I do, Chairman.

Q12 Chairman: Because they feel undervalued. The evidence we had in our engineering inquiry was they felt they were peripheral to what was happening. They write good reports, but nothing much happens.
Lord Drayson: I have met with them, if I am correct, three times in my time as Science Minister.

Q13 Chairman: Has the Prime Minister met with them, to your knowledge?
Lord Drayson: Yes, the Prime Minister met with them at a breakfast meeting towards the end of last year.

Q14 Chairman: My final point before I pass on is: in terms of international intelligence in science and technology, clearly that is crucially important for us formulating our policy, forming strategic alliances. Do you feel that there is sufficient intelligence coming into your department, do you feel we are sufficiently plugged in to get advice about what is happening elsewhere in the globe?
Lord Drayson: I think that we are plugged in, although I think that the literature, if you like, on the exploitation of science, the whole process of innovation by government, is pretty patchy in the sense of its scope and quality. I think there have been a number of very good studies, for example, on different types of model, the way in which, for example, the Silicon Valley model has developed; the Finnish model has developed; a smaller number of studies of what has been happening in Singapore. But I think we need to do everything we can to make sure that we are really clear on what is the state of the art in terms of understanding how an investment in science research can best be managed and structured to deliver the best possible impact for the outcomes of the country. How do you get the balance right in terms of the different elements, in terms of pure and applied; how do you make good allocations against the different areas, particularly in an environment where the science is moving very quickly, and where the economic environment is also changing fast.

Q15 Graham Stringer: Do you have a theory of what has gone wrong? We all want to get the best value out of science that we possibly can, and this country has had an excellent record on innovation and scientific research, but it has been less good at turning that to the economic benefit of the country. Do you have a theory about whether this is a cultural issue, whether it is a failure of government; what is your analysis, and how do you intend to improve the situation?
Lord Drayson: I think it is a hugely complex area, therefore the answer to your question is multi-factorial, but I do think that we are seeing some key conclusions emerging. I think that I would agree with you 100% that we have been truly excellent at science in this country, all the data supports that, the productivity of our science, in terms of numbers of citations, Nobel prize winners and so forth, the investment that we have made over the last 10 years has led to a renaissance in the science base. The feedback I have had is the quality of the science in our research base has never been higher. We have also been very effective in the development of intellectual property from that science base in a way that we were not 10 years ago. The technology transfer processes from universities have improved dramatically. I think what my predecessors, particularly Lord Sainsbury, did to change that, to understand the clustering effect around certain universities to develop lower economic costs for businesses, has all been tremendous. What has happened is that has led to a really quite significant number of spin-out companies being created and international comparisons in terms of the productivity of spin-outs, their numbers, and their quality, has been very good. The problem has been our ability to convert those increasingly large numbers of start-up companies into a sufficiently large number of really substantial businesses, and I think that there are a number of reasons for this. One of the key reasons is the economic environment, nothing to do with the credit crunch; the credit crunch is making it dramatically more difficult now and bringing all of this into focus, but we have seen that our high technology companies which have been built on our science base have tended to get to a certain size, comparably smaller than you would see, for example, in the United States, and then have been acquired or have stagnated. Now this has led to a failure to fully realise the jobs and the wealth that could be created for those businesses, and therefore I am very focused on what we can do to address that particular problem. So I think the agenda, the focus

is moving; it has moved from that early stage to more the mid stage. We have to maintain our investment in science, we have to maintain this very good track record in spin-outs, but we have to see more of these spin-outs grow to be substantial employers of people.

Chairman: I want to return to that later, Lord Drayson, in terms of your second session this afternoon, but I think that has been a good opening in terms of actually exploring that further.

Dr Gibson: I want to drill deeper than just the successes that we have and say: why do we get these successes, what happens? Now I happen to believe there are two things about many young people, they do most of the science in this country at the post-doc level or at the PhD level, we see that with MIT in the States, the Massachusetts Institute, where young people come in and do PhDs and get their spin-out company, because they are set up to do that; and the second thing about young people, why they are doing all this great work and getting disillusioned, is because nobody thinks they are doing anything important. They want to drill into the process of legislation and making things happen. They are full of young ideas. You must meet them at meetings, think tanks, whatever, and there are all these bright young people that say, "I do not really want to spend six post-doc periods of my life doing research and getting a citation", which is one method of judging success, it is not the only way of doing it, and we often use that in this country as the only way. But I want to see what you are going to do about making sure young people stay with science, either the blue sky stuff, or getting into industry, because I think we have a real problem with young people in this country who are getting scientific training, and maybe they will all be civil servants one day, maybe that is where they will go, I hope not, because they are as bad as financiers.

Chairman: Let the Minister give an answer.

Q16 Dr Gibson: I just want to know, what are you going to do about young people? If you were a post-doc today, a Colin Blakemore of the future, where would you go?

Lord Drayson: I would want to encourage the Colin Blakemores of the future to consider a career going into teaching, so after having done one or two post-docs, to consider alternatives to an academic research career, so consider going into teaching; there is a real need for more science teachers who have a trained background within sciences as a first degree. I would want to facilitate your ability to consider going into industry, in particular going into a technology company operating in the science area for which you have been trained. Now we have learnt through the last ten years of some very effective models as to the way in which post-docs in particular, as you mentioned them, can be moved from the academic setting into industry. For example, the relationship between a professor and their post-doc is one of real trust often, so therefore one of the ways for a professor's intellectual property to be commercialised is for the post-doc, or more than one post-doc, to actually move out of the academic setting and move into the early stage start-up company. For those two aspects to happen, I think we need to see a shift in the way in which academic careers are treated within our universities. To enable those two things to happen, we have to have an environment whereby it is possible for you to say, "I want to take a few years out from doing my academic research, for example to go and work for a hi-tech business, but I want to have the ability to go back into that academic research in the future". Now that is something which certain universities, by no means all universities in the United States—

Q17 Dr Gibson: It sounds like being a woman in science actually.

Lord Drayson: I think there is a real value in us facilitating the ability of people to make that move with their expertise in and out of the academic research environment, to business, to government policy, in terms of civil servants, to even consider going into politics, I think—

Q18 Dr Gibson: Good God no. Do not condemn them to that.

Lord Drayson: I think there is a role for more scientists in politics, and I think seriously for us to facilitate people going into teaching at different stages in their life, not only for teaching to be something which you would consider immediately after finishing your first degree, but something which could be made a natural next step for you, say, in your late 20s/early 30s.

Q19 Dr Gibson: Do you think either young people or experienced people like Colin Blakemore, who is in the room, as you know, found it fun to go into legislation, determination, making decisions and that? Do you think they felt welcome, do you think their scientific expertise was recognised in any way, or were they just a nuisance?

Lord Drayson: I can speak for my own experience, and that is that I became interested in politics because one particular issue around science, in my particular case, animal rights extremism, politicised me, I became really quite exercised and concerned about the issue, and what I learnt was that getting involved in the politics of science, science policy, was a hugely interesting and satisfying thing, it really was. So I think that the fact that the protest group developed at Oxford relating to support for animal research at Oxford, with a 16-year old student leading that, is a sign that young people's concern and belief in the importance of science is alive and well.

Chairman: Can I just park this as an issue? I think it is an absolutely crucial issue to future science policy to have a different relationship between what actually happens in the research labs in our universities and how we get these career paths, and I know Dr Harris has been pressing us for what seems like 20 years to do an inquiry on this.

Q20 Dr Gibson: Tell us about learned societies, how they could play more -- we have recommended from a previous committee that learned societies and

academies could get involved to a greater extent in policy determination; do you think they are or they are not?

Lord Drayson: I believe that this is really to be welcomed, and so an example of this happening in practice is that later this week, we will be launching a science communications campaign to address the unfortunate fact that too many people in our society regard science as an elitist endeavour. We are going to tackle this head on on Wednesday, and we are doing this in full consultation and support with the learned societies who have been involved in the development of the communication campaign, together with the research councils. I think it is the first time actually we have the full science community on board with the development of the campaign, which has been in response to the policy development which has come out of the science and society work. So there we went out, did the consultation, we asked the general public, "What do you think of science, what are the issues which concern you?", and we learnt some very important things. On the one hand, we learnt that people have a very high expectation of the power of science to do good, to address issues of climate change, for example, to find a cure for cancer, but whilst having those expectations of the importance of science, when you ask them, "What is the impact of science on your everyday life?", they regard it as unimportant.

Q21 Dr Gibson: Do you recognise that all learned societies do not move at the same speed, do not have the same understanding of the world they live in and how to engage with the politicians; the black art of politics is different from their type of black arts. Having been an academic, you know the black arts of universities, much more vicious, I think, than the politics we live in now. But there are differences between them. Some are fast movers, some are slow movers, some do not even move at all, and suddenly they discover late on that there is somebody to engage with to make policy. Is that your experience?

Lord Drayson: I think it is fair to say that there is a variety of different learned societies in their focus, some have more, I think, of a focus on the modern environment and the challenges that we face as a country today. I think what we have to do in government is to work with them in a leadership role, but very much bring them with us, and I would point to the campaign on Wednesday this week, I would encourage the chairman and the committee to judge whether or not this is an example of effective working by my department, under my championing of science, and working with the learned societies to address what is clearly an issue for us as a country.

Q22 Graham Stringer: This Committee has had contradictory answers out of the government when it has asked questions about whether it is important whether or not science is done in the regions, whether the government in actual fact has a regional scientific policy. Some science ministers have come and said, "We support Jodrell Bank, we support Daresbury, we support science in the regions", and we have also had statements in response to reports that it does not matter wherever science is done, whether it is all done in London or whether it is all done in Aberdeen. What is your interpretation of the government's policy with respect to regional science policy, and your interpretation of the Haldane principle, please?

Lord Drayson: My interpretation is that the overriding factor which is most important is that science, wherever it is done, has to be excellent science. It is the quality of the science which is most important. Now for science to be of high quality, it requires a critical mass of scientists working in an area, supported with the right infrastructure, having the ability to carry out the cutting edge experiments, and in my experience, the ability to do that depends not just on decisions about the future, it depends on history too. I learnt in my own research that there is almost a genealogy to science, like there are in so many other things in life, and therefore, the existing location of expertise, the clusters of that expertise, the location of infrastructure, is very important in terms of where it makes sense for science to be carried out. So therefore, the decision about the location of future investments of infrastructure will have an impact on how that cluster of expertise is developed, but we need to take into account the decisions rightly of the peer review process, that is the principle of Haldane, that these are not decisions which are made by ministers, they are made by the science community, directed to make decisions, allocation of resources, based upon where the excellence of science will be carried out, but taking into account where the expertise and the infrastructure lie.

Q23 Graham Stringer: That is a very conservative policy really for a Labour government, is it not? I hate the word, but it is a very non-pro-active policy. I understand that the Cavendish laboratory is the Cavendish laboratory and people are going to be attracted there, but would you not think it should be part of a Labour government's policy to create another Cavendish laboratory in Motherwell, Manchester or Newcastle, somewhere else, so there should be more direction to the government's policy about new investment?

Lord Drayson: I do believe that history has shown us that it is very difficult and can be counter-productive to believe that you can create a cluster of expertise. There are many factors which lead to the development of a body of expertise. Often that is down to one or two key individuals, and what I believe --

Q24 Graham Stringer: Can I just interrupt there? I accept that, that great scientists will attract the right research workers. But what attracts great scientists quite often is investment in equipment and facilities. There is a chicken and egg argument here, is there not? The government can intervene and say, "We will provide you with your latest atom smasher [or whatever it is] in Newcastle", rather than in London, Oxford or Cambridge.

Lord Drayson: You are absolutely right, and I think there is one factor which we need to in future, I believe, pay more attention to when we are making decisions about infrastructure. There is no doubt that the decisions that we take about next generation infrastructure will impact the development of these future clusters of scientific excellence. I believe that we need to think more in the future about that problem which I highlighted in an earlier question about the process of conversion of that science into wealth and jobs, and the fact that we have had this bottleneck up to now where we have not seen the development of our businesses far enough. I think that we can identify areas in the country whereby there is the ability for businesses to be spun out of research campuses, but to make sure that those businesses are supported by the local councils for a strategy of growth, so therefore when a business gets to the point where it is looking at its first production facility, that it would be encouraged to locate that production facility next to its R&D laboratory, and that you are developing a critical mass of expertise and wealth, not just in the science base itself, but also in the commercialisation of that science. What we have seen, has dogged us a bit I think up to now, is in some cases, it has been difficult for businesses which have grown up, for example, out of the campuses, from Oxford, Cambridge and London, to be able to make that growth once they get to a certain size of business, and I think that does force us to look for other developments of science campuses in the future.

Q25 Graham Stringer: That is answering rather a different point, is it not? That is answering what happens to research when it has taken place and how the country or the region or the local community most benefits from it. What I would like to leave you with is a final question, and a thought really: if you accept that money will follow scientists and current institutions, then most of the investment in science, as it is at present, will end up in the golden triangle between Oxford, Cambridge and London. Do you not think that for the next stage of investment, which leads to those business clusters and could lead to better development of them, that the government should review its policy on where money is invested, and look to invest more in the regions?

Lord Drayson: I think that this is something which should be constantly looked at. I do not think that you can come to a conclusion about science policy and then it is done. This is something which continuously evolves. But I do think the answer to your -- you posed this as a chicken and egg problem, where do you intervene in that process, I think you are right in describing it as a chicken and egg problem. My answer to where you would intervene is with the individual. In my experience, what I believe is that what should come first is the world class scientist, and therefore, my view as to an appropriate strategy for a university anywhere in the country looking to develop would be to identify: well, what is the subject area where we are looking to become world class, and to try and attract to that university one or more individuals who are world class in that area. What that then does is attract grant funding, infrastructure, researchers and industrial interest, which then builds that, and we have seen that as an effective model. I think that is the key to the development of science campuses in other areas in the future.

Q26 Mr Marsden: Lord Drayson, my colleague Graham Stringer has pressed you quite hard on what I might describe as the push/pull basis of where you invest, where you build up critical mass and so on and so forth. I suppose if one was being mildly caustic, one might say that to continue to review things is fine if you are looking at it from the golden triangle of the south-east and nothing is actually appearing to happen to change that. But let me pick up the point that you made earlier, because you were talking quite rightly with the chairman about the whole business of engaging with different government departments, and one thing and another, and I was interested in what you said about local councils. The one thing I do not think has been referred to so far is the regional role of development agencies. Development agencies, after all, whether people like it or not, now command a substantial amount of government funding. Should you not be in your capacity now having a pro-active series of discussions and involvements with RDAs as well as with the ministers across government?

Lord Drayson: Yes, you are absolutely right, and that is exactly what I am doing, so I have had meetings with chairmen of the RDAs, I have been discussing with them their views around the regional focus that they have in their area towards clusters of excellence, how they can work with, for example, my department's Technology Strategy Board to make sure that there is an alignment between the investments that they are making, the actions they are taking to attract inward investment, and the decisions that the Technology Strategy Board is making, again, independent from government, but making real choices about which technologies government support goes into, and making sure that all of that is aligned. I think you are particularly right to stress this in this very difficult economic environment, where we really do need to make sure that there is that alignment.

Q27 Mr Marsden: Can I just follow that up with a quick question, and ask: again, you referred in your previous answers to the importance of university impetus, investment in positions and all the rest, are you convinced at the moment that all the regional development agencies have an effective and concrete strategy for working with higher education institutions in their region to produce the sort of results that you are talking about?

Lord Drayson: Well, one can never be absolutely sure that everything is 100% as it should be, but the impression that I get is that the RDAs are doing a very effective job. The way in which the academic institutions and universities have responded to this downturn has actually been to be pretty pro-active, I think actually going out to their local business community, reminding the business community of

the resources that the university can offer, are engaged with their RDAs, and this is something which they absolutely should be doing in these times, but the sense that I get is they are doing it. If there is any feeling that they are not doing that well enough, I would be grateful to learn that and follow that up.

Q28 Chairman: I think the problem is that this is another department that looks after the RDAs, and the reality is, as science and engineering minister, how do you get a handle on that effectiveness? It would be useful—not this session, but perhaps you could give us some feedback as to what is the interdepartmental relationship which means that you have a really critical eye rather than, as you have rightly said, "I feel that that is okay", because I think you would accept that that is not good enough.

Lord Drayson: Chairman, my sense that that is working well is based upon having had a lot of interaction over the last few months with BERR and, depending upon what is the subject area, the government department that has a responsibility. So I will give you a specific example, the challenge of moving to a low carbon economy, the need to really change transportation infrastructure, and a really good working relationship which has developed between the Technology Strategy Board, in terms of the investment in the low carbon innovation platform for vehicles, working with two RDAs in particular who have identified this as an opportunity for their region, who are putting in resources and finance to support that innovation platform, and working with the Department of Transport and BERR to make sure that the work that they are doing is all aligned, so it is based upon that type of experience. The way I engage on that is through specific projects like that.

Chairman: I think it would be useful if we could have a note from your department, Minister, to say how effective do you feel all the RDAs are, because I think we can all give examples of where an RDA does some terrific work on a particular project, but there are certain RDAs, and I will not mention them, who never get mentioned, if you follow that drift.

Q29 Ian Stewart: Lord Drayson, I am going to go back to the stuff that Graham Stringer pressed you on, because I must admit, I am just a bit perplexed at the answer that you gave. You have brought very specific skills, we recognise, to the job of minister. You have described those skills and why the government has allowed you to have a cross-departmental role, to raise awareness and understanding about physics, engineering and so on, and particularly with your commercial background. That all sounds very sensible. But it is not surely that a single minister should have the level of understanding about physics, science, engineering and so on, the point there must be that the government must have that understanding, and it just strikes me as very strange therefore that we are talking here in very vague terms about the lack of government policy or strategy, in terms of regional science or innovation policy. In Haldane, as we have discussed recently, the principle that is missing, of course, is a principle on funding, and there lies the very complex area where government may have a good view of what is necessary, perhaps government accepts, for example, the Regional Studies Association report that the north and periphery of the UK is relatively weak on innovation systems. If that is accepted, and government says that it is sensible not to have everything concentrated in one area of the country, any kind of golden triangle, wherever it might be, that there is the need to recognise excellence elsewhere in the country, maintain and improve that, how can we have a situation where a government will not say that it has a regional science policy or a regional innovation policy? It seems a contradiction in terms to me. Do we need to revisit and maybe have a Haldane principles review for the 21st century?

Lord Drayson: I think you have put the focus on a very important question which we have to ask ourselves as a country, which is that in the current economic environment, and looking at the way in which the world is developing, and is likely to shape up over the next 20 years, have we been strategic enough in determining the balance of our investments in areas of science, in areas of industry, taking into account what other countries are doing, and asked ourselves the question: what are the areas that we have the best chance of being most effective and most competitive in, how are those areas likely to develop, what is going to be the competitive space, what is it that other countries are doing, and are there opportunities for us to be more strategic in the choices that we make? Now that is an enormously big question to answer. Other countries are taking the view that making strategic choices about areas of focus is the right way of dealing with the enormous complexity and the speed of change which is taking place in the modern globalised world. We have to ask ourselves whether or not we believe that is true too, and if so, what are we going to do about it.

Chairman: This is a regional issue which my colleagues are raising as to whether in fact strategically government should in fact be saying, "In order to incentivise and use science and engineering and innovation as the main driver for economic recovery, we ought in fact to have a regional dimension to that", and government has consistently said to this committee, "No, we should not".

Q30 Ian Stewart: Not only that, Lord Drayson, if we take the analysis that Graham Stringer put forward before, which you accepted, that great scientists attract funding, projects, and so on, the assumption that could be taken from the statement I made earlier about the Regional Studies Association report, saying that we are relatively weak in the north and the periphery of the country, but that does not recognise that we have great scientists outside the golden triangle. It is not just about generating great science and physics elsewhere in the country, it can be about maintaining world class science elsewhere in the country, and that is where certainly I find on this committee the complex nature of this dilemma between Haldane and a government not

having a regional strategy for physics is really quite worrying. I am glad you recognised that it was a big issue that you are tackling.

Dr Reid: There have been some really impressive innovations in science outside the golden triangle, and I think just for the record we can think of research pooling in Scotland where actually the physics community in particular have developed Scottish physics research in some really exciting ways; in Wales, we have seen the merger between the University of Cardiff and the University of Wales Medical School; and in the north-west, we have seen the creation of a major university through the merger in Manchester. In each case, as I understand it, these innovations came from the community and won support from the public purse because of the quality of the ideas and the ambitions that they were putting forward. So I think it is probably overstating things to imagine that the government must lead all of the innovations and determine the geographic distribution of these innovations.

Q31 Chairman: Would you tell us one major national facility that the government has supported in the last ten years outside the golden triangle?

Dr Reid: I think I would have to confirm the answer I am about to give, but I think that there are supercomputing facilities going into Edinburgh.

Chairman: Is that not sad that you, who are responsible for this area, cannot just name them off the top of your head?

Q32 Graham Stringer: Can I say that when we visited Daresbury, we were told that 97% of fundamental research done outside of universities was done in the golden triangle. Surely that is not a situation that any government, particularly a Labour government, can be satisfied with? It is actually the spatial distribution of investment, not just the fact that Manchester, Wales or Scotland are trying to pull themselves up by the bootlaces that is important, is it not?

Dr Reid: It is important, but I think that the examples I gave before are not just about people pulling themselves up, the university community in Scotland wins a higher proportion of research council income per capita or per GDP than the UK as a whole, they punch above their weight and have done for some time, so there are high performing communities outside the golden triangle, but the sheer scale of the golden triangle—

Chairman: I think you are actually missing the point that we are making. We understand that there are these brilliant research groups that are appearing, and the government, to be fair, funds them according to the brilliance of their science. We have no complaint about that, I do not think, as a committee. It is the other thing, as to how government incentivise with major facilities other areas of the country, but I would like to leave that at the moment because we are desperately short of time, and to bring in Evan Harris.

Q33 Dr Harris: Good afternoon, Minister. I just want to look at the issue of scrutiny and to a certain extent transparency. My first example comes from what we have just been discussing. I do not know if you read our report on the science budget allocations, which was dominated by the whole STFC business, and the government's response, and then there was a debate in the Lower House on this, but there is this difficulty of understanding what the government's position is on this. I think everyone agrees that the government's role is to set out the overarching strategy, John Denham made that clear in his speech in April 2008, and you may have more to say on how you are developing that in due course; and that researchers peer review, the research councils decide which projects to fund, particularly on the detail. So the question is: when it comes to where you site something, like a collider or something, and there are different bids, is it for the government, is it a strategic decision to park it in the north-west or south of Oxford? The difficulty we had in that report, just to shortcut this, is that on the one hand the government said, "We do not interfere in those decisions", but on the other hand, there was clear evidence which we concluded which showed the STFC council, once the government had seen their draft, had to change their decision on what they were going to site at Daresbury, and those of us from the golden triangle do not feel that there should not be a regional policy in the north-west, but if there is, it should be explicit, and then it can be scrutinised by us and the science community. I happen to think, and this is my view, that when it is government money or taxpayers' money, then the government is entitled to have a view on issues like where it should be spent. It does not mean that it is intervening on the quality of the science. I was wondering if you could reflect on that, because that is where we are struggling: the government says it does not have a regional policy, but it appears from reading between the lines of what is happening that when it comes to something politically sensitive, they very much do.

Lord Drayson: Firstly, I would say that when a decision is taken about the location of a major piece of infrastructure, it clearly will have a strategic impact, and what is important is that the strategic impact of that decision takes into account the regional development agency piece, in terms of does that piece of infrastructure lead to the facilitation of the commercialisation of that science. So, for example, investment in a supercomputing facility, will that decision, which will have a strategic impact, have an impact in terms of the location of the development of a cluster of spin-out businesses, for example. But the decision on the location of that in the first place has to be driven by, I believe, this recognition of the key driver of the excellence in the individuals who are doing the science, that is what comes first.

Q34 Dr Harris: So the regional dimension is one factor?

Lord Drayson: Yes.

Q35 Dr Harris: Would it not be good if the role of government in that decision, if there is nothing to hide, could be out there and transparent, and that is why I was wondering if you would consider reviewing the decision of the department, DIUS, not to release the allocation letters to the research councils, even if they have to be blacked over for commercially sensitive issues, just like you do release the allocation letter to HEFCE. It is still all taxpayers' money, it is still all public funding of research and teaching and research, in the case of HEFCE, but it is disappointing that the government so far has refused to release the content of those letters, so we know and can scrutinise what the government says has some strategic elements to it, because I do not think we disagree that that should be permitted.

Lord Drayson: I think that as we go forward, your argument about the need for clarity around a view about the strategic impact regionally of key investments does make sense to me, and so that is something as we go forward which I am happy to take back and look at. I am actively working with the RDAs in terms of this link-up between the interventions which they are making and the science base, but I do not see any benefit or need in terms of going backwards. I think as we go forward from here, particularly in the context of an overall strategy relating to our science policy and the development of wealth from that science, making decisions about the strategic investments, it does make sense to take into account the regional aspect.

Q36 Dr Harris: Can I just ask you then about this issue, again, continuing on the scrutiny theme, of what you said earlier? You said that you were driven by a wish to see government policy based around good science and have wider recognition in government of the virtues of the scientific method. I think we all accept that policy does not have to be evidence-based, but then it should be labelled as not evidence-based. To what extent do you think government understands that if it does not accept the clear advice of its scientific advisers, then it needs to be clear in its public statements that the policy that they have implemented, which they are entitled to, for ideological or economic reasons, is not one based on the scientific evidence; do you see the problem? Because if they say, "Well, it is still evidence-based, we just disagree with the scientists who are advising us", it rather debases the language of evidence-based policy.

Lord Drayson: I think that it is a fact that science, the evidence, is one aspect of the factors which are taken into account when making a policy decision, and I do think that it is a benefit to be transparent about the reasons why a decision has been come to. I think that it is of increasing importance to develop good use of scientific method in the development of policy, I think that is something which could be developed further, for example, in areas of social policy, operating on the basis of a sort of clinical trial development in an area: piloting something, getting good data about its efficacy, whether or not it has achieved its end points, before rolling it out into other areas. That is something which is being increasingly done, and is to be supported.

Q37 Dr Harris: Absolutely, with sensible and pre-agreed outcome measures. My last question is around a specific example. If you take government drug policy, which is something this committee has declared on, there has been consistent advice from the advisory council on the misuse of drugs about the classification of cannabis. In the government's response, which was to reject it, at no point did they say, "We now recognise this is not an evidence-based policy, it is for other reasons", which it is not the remit of this committee to comment on, that is for Parliament to decide. I just wonder whether you think there is a price to pay for that, because if that happens again, if/when the committee reports on Ecstasy, and the government on the same day that that report is published says, "No, we absolutely are not going to accept your clear advice on this", then do you think there is a danger that scientists are going to be not prepared to give their time to advising the government if the government is saying, "This is a scientific question, we are interested in the evidence", but then almost pre-empting that by rejecting it for non-scientific reasons without being clear that they are non-scientific.

Lord Drayson: Well, I believe that scientists are sophisticated people and they understand that these questions of policy are complex, they have to take into account a number of different factors, and therefore, what scientists expect is that the contribution that the data, that science can make, is fully employed, where it appropriately can be, and then the decisions are taken based around it with clarity about the way in which that decision has been reached. I am not getting a sense that there is any disillusionment amongst the scientific community in the way in which they are engaged; quite the opposite, I get the sense that the scientific community welcomes that engagement and sees that as a positive trend.

Dr Harris: Because there was a pretty strong letter to *The Guardian* about this issue.

Chairman: I am going to stop, that is something clearly we will come back to, it is a constant thread, but we have overrun, and I am going to leave the last question, I am afraid, because we have overrun on this session. Can I thank you very much indeed as far as our inquiry is concerned, thank you very much indeed, Lord Drayson, Jeremy Clayton and Graeme Reid for your evidence.

Wednesday 25 February 2009

Members present:

Mr Phil Willis, in the Chair

Mr Ian Cawsey
Dr Ian Gibson
Dr Evan Harris
Dr Brian Iddon
Graham Stringer

Witnesses: **Professor David Fisk,** Imperial College London, **Professor Lord John Krebs,** a Member of the House of Lords, University of Oxford, **Professor Julia King,** Aston University and **Professor Lord Martin Rees,** a Member of the House of Lords, President of the Royal Society, gave evidence.

Q38 Chairman: Good morning. Could I welcome our very distinguished panel of witnesses this morning to this evidence session on putting science and engineering at the heart of government policy? We welcome Professor Lord John Krebs from the University of Oxford; Professor Lord Martin Rees, the President of the Royal Society, welcome to you; Professor David Fisk from Imperial College London, welcome; and Professor Julia King from Aston University, welcome to you as well. Sometimes select committees have the knack of being able to chose inquiries which are important at the time but become less important as they carry on; this is an inquiry which in fact is gathering pace as we go along because there has been a very significant shift, as we see it, in government policy literally over the last few weeks. We are somewhat perplexed as a committee that we have had this major shift in policy. We are focussing science spending on a few specialised areas where it has a world leading position and we are interested in why our experts have got such a strong sense of commitment to this new policy agenda with an unquestioning faith that the Government has got it right. Lord Rees, what is your comment on this new agenda?

Professor Lord Rees: First of all may I say thank you very much for inviting myself and others as witnesses. I think we welcome the commitment towards science by the Government, the acceptance that whatever our economic problems are science is part of the solution and is supported. We are fortunate to have excellent science in the UK. Also we know that we are especially excellent in some areas. We have some concerns about the way in which this statement has been interpreted because one of the great strengths of the UK is that we are the only country outside the US that has a number of world-class universities. They are a great national asset in a number of ways, not just via direct spin-outs but also via the way they attract talent from around the world and train excellent students. I think it is crucially important to realise that excellent universities will only stay that way if they can attract excellent faculty. They will not attract excellent faculty unless that faculty feels able to get support for responsive mode, curiosity driven research. That is what happens at Harvard and at Stanford and that needs to happen in our universities here. So it is very important that there should not be an erosion in the level of responsive mode support that covers the whole range of science. Of course over and above that we accept that there is a great need, as in the Obama stimulus package, for special efforts; I would say energy R&D and many others. I would like to say one other thing which is that I was slightly concerned about the statement that the focus should be too much on the bio-medical sciences. They are of course excellent; they are partly excellent because in this country government funding is supplemented by the Wellcome Trust, by the medical charities and we have a strong pharmaceutical industry. Physics based sciences—which of course are crucial to the information technology industry and to energy R&D—are somewhat more precarious because they have less in the way of supplementary funding from private foundations or from a strong industrial base than bio-medical sciences. I would be slightly concerned if the concentration were to lead to any reduction of funding from the public for physical sciences broadly interpreted and from responsive mode research.

Q39 Chairman: With the greatest of respect, Lord Rees—although we as a committee are incredibly supportive of the amount of money that has gone into science over the last ten years and we need to put that on the record—if you have a finite cake and you are going to give more to X it has to come away from someone else. You seem to be thinking that it will all continue very happily; it cannot.

Professor Lord Rees: What I am saying is that I do not feel it would be a good idea if the budget for the research councils were tilted away from the physical sciences. There can be selectivity in terms of raising the threshold for the acceptance of the grant, but I do not think there should be a re-balancing away from physical sciences in government funding; if anything, the other way.

Q40 Chairman: Do any of your colleagues wish to comment?

Professor Lord Krebs: Thank you very much, Chairman, for inviting me along to this session. I would just like to make a couple of points which, in a sense, build on what Lord Rees has said. Last night I happened to bump into one of our Nobel Prize winners, Tim Hunt, who won a Nobel Prize a few years ago for his discoveries relating to cancer research. I asked him the question that you are putting to us, should the Government focus on key areas of priority and he said absolutely not. If you want to foster the kind of innovative research that

led to him winning a Nobel Prize you should allow great freedom for scientists to propose research and judge it on excellence. He made the point to me that the greater the originality of research the less predictable the outcomes are likely to be.

Q41 Chairman: Do you agree with him?
Professor Lord Krebs: I pointed to a very nice study that was described by Sir William Paten a few years ago in his book *Man and Mouse* in which he looked at ten key advances in cardiovascular medicine and he traced back where those key advances came from and he identified about 600 papers in the literature that led to these key medical developments. Over 40% of them had nothing to do with cardiovascular medicine at all and many of them were not carried out in medical departments or medical faculties; they were carried out in departments of chemistry, engineering, physics, botany, agriculture, zoology, *et cetera*. I think the difficulty with prioritisation is the inherent unpredictability of where the key advances are going to come from. If I could just add one more point, it is not that I am totally against having key themes—indeed, when I was chief executive of NERC we did have certain key themes broadly defined and the research councils have that mechanism today—but I do think that the key themes and the priorities should be presented in a broad way so that the scientists can be innovative within those themes and not be too prescriptive. I agree with Lord Rees that we do not want to see a shift in the balance between strategically directed research and responsive mode.

Q42 Chairman: Professor King?
Professor King: First of all I would like to say that it is interesting to be there, thank you, and I would like to agree with Lord Rees that we need to be careful about looking and saying that the UK appears to be doing better in the rankings in the biological/biomedical areas than it is in engineering and physical science. What we are good at at the moment is historic about what has been invested in; it is not genetic and what we need to be good at, in my view, is addressing the world's problems and the biggest of those at the moment I believe is climate change and I believe that is not only a world problem but it is going to be generating huge international markets for new kinds of products and services and therefore if we want the UK to be a successful economy we have to be keeping up our investment in the subject areas that will deliver into solving that problem. Physical science and engineering are critically important. I would say that we are focussing enormously on just the research council budget and of course there are lots of other budgets that go into research but also into applied research and moving that research into commercialisation and I think there are some issues, for example, around how the RDAs spend their budgets and I would say it is rather interesting that if you look at a lot of RDAs they all think they are going to be outstanding centres for medical technologies, for advanced materials, for advanced automotive, for green energy and I think that it is unrealistic that almost every RDA in the UK is going to actually develop an outstanding centre.

Q43 Chairman: So they should pick winners as well.
Professor King: I think we do need a bit more thinking about how we could best spend some of that other funding that is going into supporting research and moving research into industry.

Q44 Chairman: Professor Fisk?
Professor Fisk: It is a great pleasure to be in front of the Committee again, Chairman. I just have two thoughts really. I am reminded of Karl Popper's observation that if you were going to predict the wheel essentially you would have just invented it. It is very hard to talk about picking winners in science. I do contend—I do not know if this is a consensus with my colleagues—that it is a jolly sight easier to spot losers. I would have felt slightly easier if we were understanding what we were not doing and debating whether that was the right thing to stop than begin to get into these banner headlines which is always a bit risky. I would note that we are not the only country going through this sort of turmoil of trying to think what post-recession science will look like. Some of the others do have the slight advantage of a more obvious industrial base. We have a few very large science and engineering multi-nationals, I am told by BERR, and very few in the medium size category. It was the Finns who produced Nokia, for example; we did not do that. There are a lot of small companies whose one ambition, it seems in life, is to sell their IPR to a big American firm and then set themselves up as Foxtons, a profitable estate agent. As you do not have that industrial logic it is much harder. Aerospace and satellite technology are an enormous part of the 21st century and it is pretty hard to understand whether that is part of a UK package and competence when largely the IPR will remain with shareholders who live outside of the UK. I think the industrial structure is what most other countries have tended to use to try and help them work through this algorithm. It was probably how we used to do things in the 60s' model. To use an anecdote, we are indeed one of the largest manufacturers of cars in Europe but we are actually assemblers of other people's cars and that makes a lot of difference from the old traditional way in which universities like Warwick and Aston and so on related to a home-based industry and its thoughts and expectations of where the future would go.
Chairman: Thank you. Ian Gibson?

Q45 Dr Gibson: I am almost tempted to say, "Thank God for the recession; it will make us think out of the box a bit". I am always thinking of the question of who runs British science at the end of the day—we will probably get onto that later on—and how do you get these decisions through? I am interested in what you say, Martin, about the separation of physics and chemistry and so on. If you take the perspective that the thing that we need most (this is what the media plays on) is to do something about

our health—obesity, all the genome stuff that is coming out, a huge explosion of new drugs—you could not blame the politicians for thinking that health and what you put into health is the big winner. What I mean by that is not just the biologists doing their bit and the medics doing their bit, but I mean the physicists and chemists too who play a major part. It is not either/or in terms of science; the science of this country is really tremendous in terms of the health service. I would just add to what Julia says about climate change. My argument is that the science was done some time ago, it has just taken the politicians one hell of a time to realise it has been done. There is not an awful lot to know from the political point of view about global warming and so on; that is happening, the caps are melting. We can finesse the details but we need the technologies now so we need to invest in those kinds of technologies. It is business orientated; it is making these two choices.

Professor Lord Rees: I agree that we need to support all R&D related to health; and regarding climate change I agree that the science is going well and needs to be continued, but what is very important—I think Professor King was emphasising this—is that clearly the answer to the problems posed by climate change is clean energy and innovative energy sources. This requires a massive R&D programme worldwide on the same scale as the worldwide health budget. There is a tremendous disparity between the amount the world is spending on health research and the amount the world is spending on energy research. That needs to be ramped up. In the UK we ought to be trying to play a leading role in this for the benefit of ourselves and of the rest of the developed and the developing world. I think it is very important that we should realise that this is a new opportunity; this is a challenge as great as health but should not be substituted for health. Of course the other point, as has been said, is that the non-governmental support of R&D in this country is low compared to some other countries. We know that is because of the distribution of activity in our economy, but we are handicapped by that in meeting our Lisbon targets and in other ways. I think what we want to do is to ensure that public funding maintains a strong science base and that we have incentives to encourage private investment. I would like to say one more thing on that which is that we will not retain our strength in science—pure and applied—unless we get a good flow of young people into the profession. The concern is that we are at risk of not getting that and I think nothing would do more than to encourage a flow of young people into a science than a proclaimed intention to prioritise these activities.

Q46 Dr Gibson: You say that but they may be stimulated by the fact that we know where we are going and what we can do and they can play their altruistic part in the world as well as being good scientists. We could also say something about food technology and how important that is too.

Professor Lord Rees: Yes, but energy as well as—

Dr Gibson: We will start going round and you will say "And, and, and". You have to pick some things that in the foreseeable future are not going to turn the recession into the great success.

Q47 Chairman: Or do we?

Professor Lord Rees: We are well below the Lisbon targets in terms of private R&D. What we have to do is to incentivise private funding of R&D in physical based sciences rather than solely in bio-medical. If you look back to the 1970s—which you and I are old enough to remember—we will recall the opportunities lost in the silicon chip industry, INMOS and all that. That has been of lasting detriment to this country because we do not have an electronics industry; we have to learn from that and ensure that we do achieve a substantial presence in the growing industries available.

Q48 Chairman: Time is really tight and I want to get to the kernel of this. We could sit here for the rest of the day and we could all make cases for particular areas of science and say how important they are. The issue before us is that there has been a shift in government policy which says that we are going to look at those areas where Britain is world-class or second in the world and we are going to put our energies into those at the expense of something else. As a panel do you feel that that is the right policy? Where did it come from and how do we actually then make it work because somebody has to pick those areas?

Professor Lord Krebs: The implications have been made that it comes back to the point that Ian Gibson raised about who actually runs science and the decisions of the allocation of funding within the research councils once the budget has been allocated to the councils is not, as far as I know, the job of ministers; that is the job of the scientific community and the members of the council. I would say that it is one thing to have the rhetoric, it is another thing to have the implementation of the rhetoric. I do not think there has been a shift in policy yet; there has been an indication of an intention.

Chairman: Can I just stop you there because we want to challenge you on that?

Q49 Dr Iddon: I am travelling around universities, as you are I am sure, and we have had tremendous shifts in science policy. I call them tectonic shifts. We have had three new institutes set up for energy, health, TSB for knowledge transfer; we have had the six big challenges created (climate change is one of them and ageing is another); we have had the doctoral training centres set up; we have put 90% into full economic cost now. It just seems to me that we have had so many big changes that when I talked to a synthetic organic chemist—which is my field—less than 10% of the responsive mode grants are being granted and people are getting utterly frustrated at the universities trying to do blue sky research. There is even talk of British people who came back from America to here because the

conditions were right here and they were wrong in America are now thinking—particularly since President Obama came in—of going back to America because it is so frustrating at the grass roots now trying to get grants to do basic research. I do not believe that there have not been significant changes in policy.

Professor Lord Krebs: I think the success rate in responsive mode grants is a real issue of concern. It is very variable across different areas. I remember when I was at NERC there were areas within EPSRC where the success rates where very low back in the 1990s so I do not think that that is a new phenomenon. I think it is the job of the research councils to look at the balance of their spending in different areas to ensure that pressures are not excessive. There should be pressure; there should be competition. It is right that there should be very stiff competition to get government funding for research but if it has reached the point where it is unacceptably low then research councils should look at that and rebalance it. That is my view.

Dr Iddon: Can I just ask the question which the Chairman asked of you? Which organisation has been driving these tectonic shifts? Was it the Sainsbury Report? Lord Sainsbury had a tremendous influence before he left office. Who has driven all these changes in policy because frankly I do not know where these have come from? Was there enough consultation? All these changes were made in one year more or less.

Q50 Chairman: The President of the Royal Society must know the answer to that.

Professor Lord Rees: Let us emphasise that we are still focussing mainly on the science vote and the research councils and this is only a proportion of what is being spent on R&D in the country worldwide. However, I think you are quite right, there have been these changes which have been discussed with RCUK *et cetera*. Perhaps I could mention something you will know that the Royal Society feels strongly about from earlier evidence, which is that we feel the DGRC and DIUS does need some external advisory group to advise on these important decisions on allocation.

Q51 Dr Harris: The 26th January was the first time that this new policy was enunciated by Lord Drayson at this Select Committee. We are less than a month later and the Government has announced that it is not a question of "if" or "whether" we go in this direction (I am quoting from John Denham's speech the other day); we are going to go in this direction. So within month, without any White Paper or Green Paper and without any public consultation as far as I can tell, the Government has decided that this is where they want to go. Whether they can get there probably depends on whether they are theirs to go after the election. Do you have any views on the question of whether a decision like this has been made in an appropriate way?

Professor Lord Rees: To be fair to Lord Drayson he did say he wanted to initiate a debate when he spoke in the House. There has been some interesting debate, as you know, stimulated by what Lord Drayson said a month ago.

Q52 Dr Harris: Is that a debate about whether to do this in your opinion or how to do it? I was told that it was about how to do it and the RCUK head, Ian Diamond, at the same meeting said, "We are going to do this" and so did the TSB.

Professor Lord Rees: Obviously it is very important to have this debate. My personal view, as I said in my answer to the first question, is that in order to meet the goals which have been enunciated by Lord Drayson and John Denham, it would not be necessary nor indeed desirable to cut back on across the board responsive mode research.

Q53 Dr Harris: If they are not going to increase the funding in a huge way—I do not think it is realistic to suggest they will—despite the doubling we are still not that high up (even with public funding) behind Finland and France (those are the two Fs that the minister gave in his talk). We are not going to get this increase so if we are going to concentrate then it is going to have to come not just from research councils and not just a shift within responsive mode funding, but also in the HEFCE vote presumably. He is not going to say, "You do this, but you carry on your own merry way". That means that in research council funding some success rates are going to go from 20% to 40% because they want more volume there and some will go from 20% to 2%. Presumably HEFCE funding is going to follow those priorities. How are they otherwise going to do it other than by doing that?

Professor Lord Rees: I think you will have to ask to what extent one needs to make changes like that in order to accept the spirit of what we need to do. I think also we have to decide the balance between responsive mode and special programmes within the research councils. We have to decide how we can incentivise private R&D in the strategic areas. We need to decide what the strategic areas are because I think we should question whether the only strategic area is bio-medical. As I have tried to say, I think we should emphasise the importance and the opportunity in energy in particular and maybe IT as well.

Q54 Chairman: Professor King, you are looking puzzled.

Professor King: I am feeling very puzzled about this because I think there has been a lot of over-interpretation of what has been said. I am a Technology Strategy Board board member and we had a long debate about how, in this period of recession, can we be more focussed in what we are doing to try to support key technologies, key society problems and key industry development and we certainly have not been saying we are going to focus

on bio-medical. We almost seem to have turned this into tabloid headlines about there not being any energy research.

Q55 Dr Harris: I am saying that they are going to specialise—if I can use that term because it is more neutral—within each area so even if they keep overall spending the same across the physical versus biological, it is the plan to specialise or concentrate and therefore by definition to de-concentrate or dilute. Do you agree?

Professor King: I have to say that when you have a limited pot of money you actually do have to make some decisions about where you spend it and my expertise is much more in the engineering and towards the technology transfer areas, not in the pure science or responsive mode end. I certainly do feel that we do need to be thinking very hard about how we focus there.

Q56 Dr Harris: If the winners are picked on the basis of where we are good already, then the risk is that those who have shall be given more and from those who have little it shall be taken. What about areas where we need to do more where we have not traditionally done much like renewable energy technologies? We do not have a great record compared to Germany or Denmark even. Maybe that is something we should do.

Professor King: My first comment was that I do not think that what we happen to be good at the moment is genetic. I do not think it is in our genes that we are good at the things we are currently good at; it is a history of investment and encouragement in those areas. The Technology Strategy Board approach is to say, "Where are the needs and the market opportunities?" as well as "What are the things we are good at and those are the things we need to make ourselves good at?" I think that is very important and part of the point we are making.

Professor Fisk: One of the things the UK is good at is getting good value out of its responsive mode. If you look at some other countries where money is handed over to universities in a rather unstructured way they actually get nothing like the imagination and creativity the UK gets out of its responsive mode. Not being as skilled as my colleagues on my left in reading between the lines in government statements I am really not sure whether the responsive mode is swept into this model of a more directed approach. If it was that would be a source of real concern because the UK is really good at thinking ahead on things in that mode. If, on the other hand, it is about challenging research councils and their themed programmes, as someone who is actually privately funded I would not be quite so worried. I am not sure that research council themed programmes are any better than the sort of picking winners you have had before. Their characteristic is that they are five years behind where the real research agenda is. If you want to take an easy one, you mentioned the grand challenges in the research council processes. It is interesting that one challenge that was not there was running the global financial system.

Q57 Mr Cawsey: I am a lay person on these things and I feel quite confused about all this, if I am honest. However, it strikes me that what you are saying is that it is important that we keep lots of eggs in different baskets because you never know where the next Nobel Prize is going to hatch. I can understand that. Then you also said—I think you said it, Professor Rees—that back in the 70s we lost electronics; we have just lost plastic electronics and I think you could build a case that the old world, if you like, that seems to be that status quo that a lot of you want to defend, has been the cause of that. Money went into that, research was done on that, technologies were developed all in the UK but they were not then backed to the extent that they could become bigger and make a real contribution to the British economy, they might make a big contribution to the German economy. Do you not think that that is evidence that what we need to do is, having done the embryonic research, back it as a winner and ensure that Britain gets the result of that? There will be some losers inevitably if you take that sort of approach.

Professor Lord Rees: Absolutely, but you are talking about the R&D rather than the kind of research in universities. I would like to reiterate two points. Firstly, we are lucky to have world-class universities and we will not keep them unless we can attract faculty across the board and that requires some responsive mode, but also, being realistic about the potential shortage of money, there are other ways to cut overall budgets than by focussing in certain areas. One can focus in a smaller number of centres; one can raise the threshold of excellence needed to give a grant. So I would question that one is forced to make these choices between subjects on strategic grounds at the level of the more responsive mode grant.

Q58 Chairman: That is a very interesting response, but none of that debate appears to be going on. For instance, one of the suggestions is that we could, for instance, concentrate—as Charles Clarke wanted to do –our blue skies research in a smaller number of world-class research institutions. That is one way of doing it. Is anybody having that debate?

Professor Lord Rees: We certainly are in the Royal Society and I think other bodies are too. It is very important that issues like this are coming up within UUK with regards to the allocation of the QR funding et cetera. I think all of these issues are very live indeed. John Denham has also spoken on this point.

Q59 Chairman: You would support the idea of concentrating research in fewer institutions.

Professor Lord Rees: I would support possibly concentrating graduate education in fewer departments but I think it is excellent news that there is good research in so many universities.

Chairman: You would make a good politician, Lord Rees!

Q60 Dr Gibson: It is the PhD students and the post-docs that do all the research. If you want research you cannot do away with graduates.
Professor Lord Rees: Absolutely not. Can I address this for a moment?

Q61 Chairman: No, we will leave that there, thank you. John, you wanted to come in on very quickly on this.
Professor Lord Krebs: I have just one very brief comment on focussing and concentration. It is worth bearing in mind the comparative figures in the UK: there are roughly speaking 150 institutions that call themselves universities, of which about 90% offer graduate programmes. In the United States there are something like 4,000 institutions that call themselves universities of which less than 10% offer graduate programmes. That is just a comparative fact about concentration.

Q62 Dr Iddon: I believe that the Haldane Principle is dead and that central government is now calling the tune more and more. What does the panel think of the Haldane Principle? Is it dead?
Professor Lord Rees: I fervently hope not.
Professor King: I think it needs renewing personally. It is treated with some awe and we should move on and look again at how this should be done. Again, we are talking about research at very much the basic research end. I talk about research to mean things that go right into new products, processes and business models in industry. There are some very different issues across the whole innovation chain; you cannot put it all into one bucket. I think there are areas where we should be focussing and I actually think we should be trying to persuade some of our very best young scientists and engineers to work on some of these big societal problems and problems that could really contribute to the economy. I think we have to make them attractive enough that actually some of those people who might have been applying for responsive mode funding and getting frustrated by it actually see that there are some other opportunities for applying their intellect which might be equally stimulating and the thing that excites me is about seeing what they do actually translated into real products and into the stimulation of our economy and indeed into making the profits that will enable us to invest again with more research in our universities. We have to see the whole process.
Professor Fisk: It is my impression that the Haldane Principle was dead in the early 1980s. It is a 1918 principle. Apart from *Magna Carta* I cannot think of any other principle that ancient that clutters around in public life and I think actually its term is positively unhelpful for the end point you want to have. It sounds as if it is Lord John's barons asserting their right to do what they like. In most other countries there is an analogous principle but it is one about the freedom of the academic community in public life to contribute to the quality of public life. It seems like a public interest principle and not a self-interest principle. My own feeling is that we ought to be much clearer on what we think is the value of independent research in a world which is always changing. The political system is solving today's problems but needs engines at the back to try and understand what is really going on so that next week's problems are more soluble.

Q63 Dr Iddon: This proves the principle that if you ask four academics for a view you get four different views.
Professor Lord Krebs: I am uncharacteristically almost going to agree with David Fisk, a rare event. There was an interesting piece written by Bill Wakeham about the Haldane Principle in *Science in Parliament* recently and he draws essentially the point that David makes, that although we all talk about the Haldane Principle it is not exactly clear what we mean by it. If we mean by it that decisions about allocation of funding to individual projects should be made through peer review by scientists for scientists, I do not think that has been eroded. Although you talk about these seismic shifts and tectonic plates and various other geological metaphors, I do not think what we are seeing today is really that new in comparison with what we have seen over the last 15 or 20 years. There have been many occasions when science ministers have stood up and said, "We have to focus on national priorities". To me it is all a matter of balance. Of course we have to justify spending public money on scientific research in terms of some broader benefits to society but those benefits can be many and varied, including tapping into the global knowledge base by having our own expertise, but as long as there is a core of funding that is for scientists to judge what are the most innovative, creative projects that are being offered at the moment and to fund those, I think the Haldane Principle is not dead as I interpret it.

Q64 Dr Harris: On the question of strategic priorities, some of you have raised concerns about the impact of switching money from one stream of research to concentrate it in another, but it looks like the decision that they want to do that has been made. Professor Rees, are you expecting the Royal Society to be consulted on how to do it? You have given a view that the way they are proposing is not the only way to do it and which to switch into. Are you expecting to be asked for your advice or are you expecting to be asked your advice and then the Technology Strategy Board will give the answer? Or do you think you will not be asked and it will just be for the research councils to argue amongst themselves?
Professor Lord Rees: We shall offer our advice whether asked or not, but I think we will be asked. I hope we will be asked. We will offer advice because the Royal Society is plugged in in a unique way to expertise in all fields in the UK and I think our view is important.

Q65 Chairman: Lord Rees, could I just broaden that question? There is a whole host of different organisations which offer advice to government from, obviously, the Royal Society and the Royal Academy and the other learned societies (Royal Society of Chemistry, Institute of Physics et cetera). Is there a better way of actually getting that advice in a more formalised way to government? Should we, for instance, follow the route of the American academies where in fact the Royal Society and other organisations are actually commissioned to provide advice? After all, you have at your disposal a fairly strong body of eminent scientists.

Professor Lord Rees: I think it is difficult for government to get a whole lot of conflicting voices which they have to calibrate and this was, for example, a particular problem in science education. What the Royal Society did in that context was to set up a consortium called "score" involving other learned societies, chaired by Sir Alan Wilson, to speak with one voice. We believe that that is an effective way in which we can coordinate views and also have a more effective and helpful input into the Government on that particular issue. I think there are other examples where the Royal Society, because of its unique range, can help and obviously it has to work as appropriate with other academies and other learned societies. As regards to the contrast with the United States, as you know, the United States has three academies and they have NRC with is a large institution with 1200 employees, I believe, that churns out reports at the request of government. We, at the Royal Society, are smaller and we are more independent, but we have a tradition, we believe, of providing very high quality advice. I mentioned over the last few years infectious disease in livestock, nano-science and nano-technologies, (a report that was widely praised nationally and internationally) on ocean acidifaction, bio-fuels and also on educational issues. These are reports we do by being able to draw pro bono from our expertise.

Q66 Chairman: My point is, should you be commissioned to do this? Should there be a formal mechanism by which government actually commissions you and pays you to actually offer that advice?

Professor Lord Rees: The nano-science one was indeed done at the request of government and we would welcome further commissions of that kind, although we accept we cannot perform quite the same role as the Foresight studies. At the moment there is a Royal Society study on biological enhancement of food crops production chaired by David Baulcombe, one of our distinguished fellows and a Lasker prize winner, and they are doing a comprehensive job in liaison with a Foresight study on a related topic which is being done under John Beddington's direction in the Government. So I think there can be complementarity.

Dr Gibson: Just for the record, there were two nano-technology reports which came out at the same time; it was a deal done between the Royal Society and this Committee who decided they would not stand on each other's toes and they complemented each other quite well. That was an example of working together. The best example I know of is in the cancer field which was again promoted by this Committee some time ago when we formed the National Cancer Research Institute, not a red brick building which I wanted in south London but one which was a virtual one. I think it has been an outstanding success in which all the different charities meet and decide on the policy that is going to be carried out in cancer. They know they cannot take head and neck at the same level as prostate and so on but they meet together and formulate national policies. Are we going to have something like that?

Q67 Chairman: You can bring that round to the central thrust in terms of what the Government is trying to do in terms of choosing these areas where we are world class to actually follow.

Professor Lord Rees: I think the Royal Society has a unique role to help provide independent advice by drawing on expertise. It must do this in coordination with government and, quite apart from the major studies I have mentioned, we have contributed to issues of plutonium, bird flu et cetera.

Q68 Dr Gibson: What about the Royal Society of Chemistry and the Royal Society of Biology that is about to be formed? Will you be formulating a group with them?

Professor Lord Rees: The Educational Consortium does involve them of course.

Q69 Dr Gibson: Make it political, you mean? That is what we are saying. You really have to tell the Government or they will tell you.

Professor Lord Rees: Absolutely, and we will offer advice even if it is not requested of us. I think we must remember that President Obama, when he introduced his dream team of science advisors, said that the Government should listen to scientific advice "even when it is inconvenient, indeed especially when it is inconvenient".

Professor Fisk: Chairman, my slight concern would be that Americans are much sharper about the structure of the public sector so they would be much clearer whether the National Academy of Sciences reported to Congress or to the Administration. They would be much clearer in their own minds whether or not both the Royal Society and the Royal Academy of Engineering depend on quite large streams of funding from Government which go through swing door processes but broadly speaking they are not quite as independent as you might have expected if they are only being funded by the membership. Then of course they do have the problem that although they have a brand title which is, as it were, the whole distinguished membership, it is very unusual for any of these reports and processes to be processed through the membership. It will be processed through a small number of members, very distinguished in their sphere, who have just few part time days that they can contribute to the report. That is really quite different from some of the very

big national Academy of Science studies that the world often talks about. If we were to move into this process of independent advice—personally I find myself warming to it—I think the Committee might want to pay some attention to the mechanics to make sure that those who are giving advice do feel that they are in a position to do so. Otherwise you will simply have retypes by the policy divisions inside these various institutions that is not moving very far from what you would have received from the Civil service.

Q70 Dr Harris: I want to probe this issue of independent scientific advice and to what extent the panel feel that the Government is an intelligent customer, a mature customer or even a rational customer. Let us say there is a controversial area of policy—food supply—and Professor Krebs, who is an academic active in the field, is asked to advise the Government because he is an academic active in the field of publishers. Let us say that he is head of Food Standards or something and, incidentally to that, he publishes an article in a peer review journal that comes to the view that GM is a good thing. The Government does not happen to agree with this and they demand that he retract and apologise for that view because it is not what they want to hear. Professor Rees, if he was a member of the Royal Society would you feel that that was an acceptable behaviour by the Government or would you see that there were drawbacks to that sort of activity?
Professor Lord Rees: I think it is crucially important that advisors should be independent. They should be listened to seriously, even if their advice goes against the preconceptions of the government department concerned.

Q71 Dr Harris: Do you think, Professor Krebs, if that had happened to you or to someone, someone might feel constrained in what advice they then gave independently to the Government because they feel they might be hectored, bullied and asked to apologise for their scientific publications if it did not match what the Government wanted to hear?
Professor Lord Krebs: First of all I think it is quite wrong that the Government should criticise independent scientific advisors for publishing scientific work in the peer review literature. There is absolutely no doubt about that. They are free and able to do that and should be autonomous. Whether they feel intimidated by pressure from ministers, if they are put under pressure then they should not give in to that, they should stick by their independence. I cannot judge what would happen to individuals; I certainly would not be intimidated by it.

Q72 Dr Harris: Professor Nutt did apologise which suggests he did either feel intimidated or felt he had something to apologise for. I am asking you whether you feel that any advice that now emanates from that source might be perceived—whether or not it is—as being somewhat constrained by fear that there might be another public attack on the messenger.
Professor Lord Krebs: It is very hard to judge what the perception will be, but I would simply reiterate that independent advisory committees are there to offer independent advice and that is what they should do. As I understand it—you are referring now to Professor Nutt's publication—that was not in his capacity as chair of the Advisory Committee, that was as an independent scientist. So it is one thing for him to be attacked for his independent scientific work (which he should not be) but it is a separate issue as to how that affects the working of the Advisory Committee. I would emphasise the independence.

Q73 Chairman: I do not really want to follow this line further as we only have five minutes left of this session. When Lord Drayson was before you and my colleague Evan Harris asked him what was the methodology for agreeing on the areas of priority, he mentioned whether peer review would be the way to do it and Lord Drayson thought peer review was. Do any of you have a view as to how the Government should go about choosing the areas where we should really put our priorities? What would you do?
Professor Lord Rees: I welcome the fact that he asked for wide debate and I think it is very important that there should be wide inputs which bodies like the Royal Society could coordinate. I would like to make one other point since I, like others, am a university professor. We all welcome the report from the CST which says that more could be done to engage the academic community with policy making and obviously academies and learned societies can do this. My own university is setting up a science and public policy centre to provide a clearing house, as it were, whereby academics can engage with policy makers. I think that is a good model because we want to draw more of the best scientific experts into the policy process. Some are already savvy about these matters but many are not and universities could help them.
Professor Fisk: The words "peer review" are getting very close to the Haldane Principle in my terms. What I have noticed, working with industry, is that they have almost added an extra qualifier and use the words "peer assist" which is essentially the critiques of your peers but in a constructive fashion. We have drifted slightly in the UK British science community into peer review being largely negative and destructive. If ministers and government departments want to engage with the scientific community they do need some way of feeling they have an added value of constructive criticism and over recent years that has been quite hard to illicit.

Q74 Dr Harris: Professor King, let us say that the Government wants to invest in those areas of physical and bio-medical where there is an existing track record and/or potential for economic benefit. Throughout everything they have said it looks as if it could almost have been written by Lord Mandelson. Who should make that decision? They say they want

you guys to decide; do you think the Technology Strategy Board is best placed to answer that question or university academics?
Professor King: I think it depends where you are in the innovation chain, if you like. I would agree with Lord Rees that there is an area of basic research which has to be really high quality research which the Government and industry should not fiddle with. I disagree with a lot of the debate how the funding divides but that should be there and it is very precious. It is for the ideas that you do not what good they may be in the future but they are fascinating and interesting and we should encourage some of our scientists to be doing exactly that kind of thing. Who should decide on how you take the decision? It depends on where you are in the innovation chain and how close you are to exploitation and to having this impact on the economy. If you are a company and make particular types of product you make very, very clear decisions on what sort of R&D you want and what you are going to fund in universities. There is not one size fits all; it is a complex process.

Q75 Dr Harris: I know about this cross-cut cutting stuff but there is a stream of astronomy based research and applied, aerospace basic research physics and applied, medical categories basic and applied and my understanding is that the Government is not going to de-fund basic and put it all into applied. It wants to expand the basic and applied streams in some areas where there is either strength or potential and reduce it in others where there is found not to be strength and potential for economic growth. I am accepting that it is not an attack on basic science in those areas; I am asking who should made the decision if it is going to be made by peer review—as Lord Drayson feels it could, international peer review maybe—whose advice should they take? People like you and your board who think about economic applications or the basic scientists?
Professor King: I am saying that it depends on where you are in the innovation chain. The basic scientists are the best people to look at the quality of basic science and the opportunity there but as we are getting closer to application and to actually using that research I think it is very important that organisations like the Technology Strategy Board, consulting with industry (the Board has a major programme engaging with industry), are looking at, for example, what is the important basic research? I would not call it basic research if we know it is for aerospace because it is already applied by the time we know what it is for. I do think that our industry in that area should be helping to advise and prioritise that research.

Q76 Graham Stringer: Professor King, we have heard that the Finnish Government did very well in helping the development of Nokia—as mentioned earlier on—and there are examples of government involvement and direction of science in war where there are clearly benefits. What is the best example in the recent history of the UK where the British Government has decided to take a similar sort of initiative by saying that investment in this part of science will help the economy? What is the best example of where that has been successful in the UK in the last 20 or 30 years?
Professor King: I have no feel for the whole scope of what the Government might have done but we have some outstanding examples like the airbus wing technology which was funded by the old DTI programme. We have some outstanding examples of technology in Rolls Royce large engines. Rolls Royce moved over quite a short period of time from being a minnow in the aero engine market to competing for top place in the engines for large aircraft. It was then supported by funding of innovative programmes through the DTI. So there have been some really outstanding examples. The ones I know from my background happen to be in aerospace but I am sure there are others in other areas.

Q77 Chairman: Lord Krebs, you have the last word.
Professor Lord Krebs: In answer to the question of who should decide, is it the scientists or is the people who are applying the science, I think it has to be a mixture of both. It is partly about the new ideas coming forward and partly about how they can be applied.
Chairman: On that note could we thank very much indeed Professor Lord John Krebs, Professor Lord Martin Rees, Professor David Fisk and Professor Julia King. Thank you very much indeed for coming to us this morning.

Witnesses: **Dr Tim Bradshaw,** Confederation of British Industry, **Professor Dame Janet Finch,** Council for Science and Technology, **Baroness O'Neill of Bengarve,** a Member of the House of Lords, British Academy and **Ms Judy Britton,** Government Office for Science, gave evidence.

Q78 Chairman: We welcome our second panel this morning. We welcome very much indeed Dr Tim Bradshaw from the CBI, Professor Dame Janet Finch, Co-chair of the Council for Science and Technology, Judy Britton, Deputy Director of Science in Government, GO-Science and Baroness Onora O'Neill, President of the British Academy. If I could start with Dr Bradshaw—this is a question that was put to the last panel—do you feel that the Government is an intelligent customer of scientific and engineering advice? If not, what should it do to improve the situation?
Dr Bradshaw: Thank you very much for inviting me to come here today. I think broadly speaking yes, they are an intelligent customer. However I would like to put a caveat on that in that science is more than just the sort of physical and biological natural sciences; we would like to see a little bit more advice

coming in on the social science side. Previous witnesses mentioned some of the big challenges facing the country—things like climate change—and our view is that part of the solution to that is technological but another part of that is the behaviour change aspects which will need significant amounts of social science type research and investments to actually make sure they take place. That is exactly what business is doing; they are investing in not just the technology and the R&D that you see reported, but also in the human factors, social science aspects of it too so the technologies they bring to market will actually find traction and make a difference in changed behaviour. I think if there is one thing the Government can do a little bit more of is perhaps building up on that social science side as well as the purer science and engineering side of advice.

Q79 Chairman: In terms of this agenda of choosing areas of advantage—if we do not call it picking winners—you feel that the Government has sufficient scientific and engineering expertise in order to be able to become an intelligent customer, in order to put tax payers' money into particular areas.
Dr Bradshaw: I think if it draws on the expertise in the bodies it funds—like the Royal Society, the research councils, the Technology Strategy Board—and comes and talks to business and others as well then yes, there are enough pathways of advice to help the Government. It is a case of whether it has the vision and ambition to actually use those effectively. We will see; it is getting there perhaps.

Q80 Chairman: You are hedging your bets now. Professor Finch, do you feel that the Government is an intelligent customer?
Professor Dame Janet Finch: Obviously as Co-chair of the CST I approach this from a slightly different angle from the CBI. I think I can do no better than make reference to the report that Lord Rees mentioned in your previous session which is the Council's most recent report entitled *How Can Academia and Government Work Together?* It is a report which was actually commissioned by the Secretary of State, John Denham, and has been published as part of a series of reviews of higher education. Yesterday evening we had a specific launch of this report in which we are analysing what the impediments are to greater and closer involvement of academics, not only giving advice but also supporting policy making within government, and how those impediments can be overcome. I am very pleased to say that the Secretary of State spoke at that event and announced that he has commissioned an individual to produce an action plan based on our recommendations. Certainly there is more that can be done both at the university end and within government to encourage more extensive, effective and closer working relationships between academics and policy makers.

Q81 Chairman: In terms of the current policy shift—whether it is huge or minor depends on your viewpoint—was the CST involved in those changes?
Professor Dame Janet Finch: The CST meets next week and we will be considering the recommendations as we understand them that are coming from both the Secretary of State and Lord Drayson, so formally we have not formulated our advice to government yet. We expect to be doing that and we will do it next week. I can draw on a number of things we have done to date.

Q82 Chairman: Can I just stop you there because I think the point of my question was, if the Government has already made a decision and is then consulting you that is very different to you being part of that formulation of policy.
Professor Dame Janet Finch: I was sitting in the last session and I think my understanding mirrors that of one or two of your other witnesses that government has initiated this debate, has indicated that there are some principles that it feels it needs to follow, but is still inviting inputs to that debate. That is what CST expects to make.

Q83 Chairman: It is not a debate, is it, when the chief executive of RCUK says that they are enthusiastically supporting this initiative?
Professor Dame Janet Finch: I have not read what Ian Diamond said so I cannot comment on that. I think the principle of prioritising government investment in research is well established so I do not know whether he meant anything more than that. I really cannot comment.

Q84 Chairman: Baroness O'Neill, Tim Bradshaw made an interesting comment about the need for greater social science within government policy. Do you think that there is a tendency in this particular debate about looking at where we channel our efforts in terms of getting the greatest economic benefit from our science and engineering base to ignore the social science base?
Baroness O'Neill of Bengarve: Yes, I think there is.

Q85 Chairman: What should we do about it?
Baroness O'Neill of Bengarve: I do have some ideas but first of all I think it matters to try to see exactly where social science and humanities research add economic value. I take it for granted it is part of the background that they add value of many other sorts (cultural value, public value and so on), but I think they add three sorts of economic value. One is that where one achieves research in these areas it has very considerable indirect economic impact. It is hard to measure but we all know, for example, that sophisticated workers in a knowledge based economy will wish to go to those countries where there are these other things available. The second is that they are the prime source of economic value for what we might call the cultural industries and sector. We think immediately of publishing, of international research students, of the BBC and tourism and heritage which are very major employers in this

country. Again it is very hard to put your finger on the proportion of their employees that is research driven as it is very hard in engineering too to know what proportion of the value produced and the employment produced lies in the quality of the research. However, it is definitely a major source of value and employment. Thirdly—I think this speaks very much to what Tim Bradshaw mentioned—humanities and social science research is a crucial adjunct for the intelligent innovation in all research, including all stem research. I say a crucial adjunct because we all know that we want effective rather then ineffective legislation but we do not even know in this Parliament when we have produced ineffective legislation as this Committee will be aware. We want to know which management structures and which ways of working are effective. For example, research done at Aston on team working tells you crucial things about what works and what does not work. We want to know about the ethical, legal and social implications of innovation and then of course we want to know about the public engagement matters. I put that last because it is mentioned most and it completely underplays what humanities and social science research can contribute.

Q86 Chairman: I was surprised that when Lord Drayson made his initial remarks supported by Lord Mandelson—or perhaps it was Lord Drayson who was supporting Lord Mandelson—and now it appears to have become hard line policy from DIUS, you did not make any adverse comments. Clearly the assumption is that if additional resources are going to be put into key areas of science they are going to be taken away from arts and humanities.
Baroness O'Neill of Bengarve: That is a simple assumption and I take it that you are correct, that there is no expanding cake in these times. We suffer all the time across the whole diverse research community from the fact that money that goes here does not go there, so you do not actually know in an absolutely clear way. My own view is that step one to clarity is that when we talk about science we need to remember that there is a distinction between science in the broad sense f(or which DIUS is responsible through a number of delivery organisations) and science in the sense of stem research. It looks as though—but we have to say so far it is a matter of speeches—stem research is being favoured and within stem biological sciences looking to our glorious past and present, so to speak. Whether that is the reality I do not know, but if you want to have successful innovation you actually need to keep the other streams going. I would want to generalise what Lord Rees said when he pointed out that you are not going to do the medical and biological research well if you try to shrink physics or chemistry; I would say that you are not going to do the stem research and stem innovation well if you try to shrink or do without the other sorts of research.

Q87 Chairman: I find this a most bizarre world that we live in. We are going to have greater concentration, we are going to have more resources put into it, but nobody loses. It cannot be that way.
Baroness O'Neill of Bengarve: It cannot, that is correct.

Q88 Mr Cawsey: Dr Bradshaw, I understand that you said previously that the US Defence Research Projects Agency has a good model for building scientific and engineering capacity. I am interest in what sort of lessons you think we can learn for the UK patent. Is it the sort of model we should be trying to instigate and roll out in this country?
Dr Bradshaw: I think the Technology Strategy Board is developing in that direction which is what we wanted to see. It is mission driven, but perhaps not as mission-driven as DRPA is. DRPA has a very clear role, it is to look for radical innovation in the defence technology area to avoid the US being surprised and then to surprise its adversaries. If we adopted that same sort of ethos in some of the other big challenge areas in the UK—defence, energy, health or any number of other areas—then I think we could lead the field on some of these things. Their mission is very clear: innovation, challenge-led, get out there and do it, cut the red tape. I think if we had a little bit more ambition from some of our government departments and delivery agencies to actually think some of the unthinkable things, get rid of some of the on-going existing projects which are not going to deliver and actually think something a little bit more radically, then yes, we could deliver too. Do we have that ambition? I would say perhaps not at the moment.

Q89 Mr Cawsey: Do you think that is perhaps because we are trying to create something like it but perhaps it is still a bit embryonic, still a bit lacking in ambition and still trying to find its feet really?
Dr Bradshaw: The Technology Strategy Board is getting there and I think the main problem with them is that they just do not have the funding to take forward the programmes of work that they know they should do. If you look at things like the aerospace technology strategy that has been set out for them very well, I think they are only funding about a third of it. That is one area where there is a fantastic strategy already written up, business knows what it wants to develop, the academic researchers know what they want to develop and we are just not being able to put enough funding concentration into that to deliver it.

Q90 Mr Cawsey: I suppose in the end that comes down to decisions right at the top of government and this is more general to everybody, not just to yourself. We have been told at previous discussions we have had that Tony Blair was very keen on the science community and had them in for regular discussions so that he was happy with what was going on, but perhaps less so with Gordon Brown. That may just be that Tony Blair was particularly interested rather than any criticism of the current

prime minister, but whether it is him or his strategy unit, do the scientific community have the ear of government right at the very top so that there is the drive and ambition to push these things forward? I am really interested in a general comment from any of you about how you are finding contact with government.

Professor Dame Janet Finch: The Council for Science and Technology met the prime minister just before Christmas.

Q91 Chairman: For the first time.

Professor Dame Janet Finch: Yes, for the first time under the present prime minister. I think that we found a very ready ear for the issues that we put before him on that occasion. I am also aware that if government is to be influenced at the highest level it is also important that the Policy Unit and the Prime Minister's Strategy Unit and so on are focussed on these issues and again CST has had recent and regular contact with those groups. I think our feeling is that this Government is taking science very seriously. That is partly reflected in the past history of investment in science and all our recent contact suggests that the Government is extremely serious from the prime minister downwards about the importance of science in helping us out of the recession. There may be debates about the ways of doing that, but I do not think that we would have any doubt about the seriousness of it.

Q92 Mr Cawsey: Do you think it took the recession to get that interest?

Professor Dame Janet Finch: No, I think the commitment to science and funding science has been there for a long time.

Q93 Chairman: Judy, do you see a lot of the prime minister?

Ms Britton: Not personally, I have to say. The Government Office for Science has very, very strong connections with the Strategy Unit through Foresight projects and through our more general work. We meet very regularly with them about what they are doing and what we are doing and how those two can influence one another. I think how science fits more generally into policy making is very much there on the agenda through the various key themes that the prime minister has set out and so on and does take very strongly how they actually do that.

Q94 Mr Cawsey: It is important that it happens across government departments. How do you ensure that that happens and what is your experience of that?

Ms Britton: We do that through the community of chief scientific advisors which I think is getting stronger and more effective all the time. A particular initiative of John Beddington has been to gather the key ones together into a core group working and challenging sometimes (on things like the Gallagher Review of bio-fuels and peer review of elements of government policy) just gathering together, talking on key areas (like climate change, food, counter terrorism) and making sure that everybody is joined up together and bringing together work to feed into the policy of their departments. I think that is working very well. Mentioning the research councils and their themes, another initiative that John is just trying at the moment is really to take some of those themes and say, "Yes, the research councils are working on them but we need to be working on them as well. How can we actually get together in these areas to take them forward more strongly?" The research councils, for instance, are working on environmental change where they have gone beyond the research councils to gather people together and the Government wants to be much more strongly linked into that. That is one area. Another area that is he is wanting to look at is global security. You will remember that John has very strong views on all these different global challenges on climate change, on food, on water, on population and migration and so on and how we can actually work on those together. So another area he wants to work with research councils on is global security. Finally, he is actually looking at one with the research councils rather than the TSB, looking at what the research councils know about things like high tech manufacturing and also at the way the economy develops and so on. That is a slightly different area that he wants to get into, being an economist by background as well as a scientist.

Q95 Mr Cawsey: Everybody thinks that government departments would be well advised to take notice of science in all that they do, but one of the problems is that the number of scientists that go into the Civil Service is not as high as perhaps they have been previously. It seems to me important that we have some way of ensuring that civil servants have a better understanding of science and have a better understanding of how to make use of it. How are we making progress in engaging the Civil Service so that science becomes a more core activity?

Professor Dame Janet Finch: I have already mentioned CST's report on how academia and government can work together. One of the recommendations that we make is about building capacity within the Civil Service as well as capacity within the academic community to engage more effectively with each other and a particular part of that recommendation is the significant extension of secondment schemes in both directions and at all career levels. There are some good examples at the moment. The ESRC has run a placement scheme for academics to work on short term secondments—six months or 12 months—in government to do particular projects. We would like to see a considerable extension of that scheme across all the disciplines and also a number of other ways in which the career progression of both civil servants and academics can be more tied directly to effective engagement with each other. There are quite a number of measures that can be taken, we believe, that will encourage cultural change both in the Civil Service and in academia to make this a much more routine part of both sets of people's lives.

Q96 Dr Harris: Professor Finch, you and the CST are independent of government, are you not?
Professor Dame Janet Finch: We are part of government but we are an independent voice.

Q97 Dr Harris: So you are speaking to us now independently.
Professor Dame Janet Finch: Absolutely, yes.

Q98 Dr Harris: You do not have to look over your shoulder.
Professor Dame Janet Finch: No.

Q99 Dr Harris: How often has the CST met Gordon Brown?
Professor Dame Janet Finch: Once.

Q100 Dr Harris: In your evidence you say that you most recently met Prime Minister Gordon Brown in December 2008.
Professor Dame Janet Finch: That was the first time we met him.

Q101 Dr Harris: That was not only the most recent, it was the only time.
Professor Dame Janet Finch: That is true, yes.

Q102 Dr Harris: I am not sure that that is entirely clear from reading that; it looks as if it was the most recent of several.
Professor Dame Janet Finch: We met the previous prime minister before that.

Q103 Dr Harris: I got the impression from one of your earlier answers that you do not think that what we were discussing with the first panel—the Drayson initiative—is a significant change of policy. We think that the Government has announced a change in policy and is having a debate about how to influence it. Do you agree that this is a relatively recent change in policy; this is the idea of picking strategic areas to publicly fund.
Professor Dame Janet Finch: There has been a speech by Lord Drayson and another one by John Denham and we are very interested in exploring the consequences of those. There has not been, as I think somebody did say in the previous session, a set of formal policy announcements about how this is going to happen so I think we see this as something that is a discussion which is continuing and to which we would wish to contribute.

Q104 Dr Harris: I find it curious that there has not been a Green Paper or a White Paper when I think they are quite clear that this is what they are going to do. I am surprised that they have announced this proposed change of direction without the CST having been asked for its opinion in advance. You say you are going to discuss it this week but clearly you have not been in a position to offer any advice on this proposal before now.
Professor Dame Janet Finch: I think that your interpretation that there has been a definite change is obviously slightly different from my understanding.

Q105 Dr Harris: We agree there were speeches that attracted interest around policy direction.
Professor Dame Janet Finch: Yes.

Q106 Dr Harris: Did you know they were going to be made?
Professor Dame Janet Finch: Ministers do not advise me when they are about to make speeches, no.

Q107 Dr Harris: The point I am getting at is that you said in your evidence that you have an extremely close and productive relationship with DIUS ministers, in particular John Denham and Lord Drayson, yet I think they would say—at least Lord Drayson said—that this is a really significant announcement he is making and he came here to do it publicly. John Denham got a whole group of senior people together last week to make a speech around that issue too. Are they going to come and talk to you about this?
Professor Dame Janet Finch: I am sure they are, absolutely. I do not think I can add much more to what I have already said about CST's role and the timing of this.

Q108 Dr Harris: Do you accept that it could be interpreted that you have been sidelined in a sense because you could be asked—do you expect to be asked?—to help advise, if they go down this path, what the strategic areas are.
Professor Dame Janet Finch: Yes, and in fact we have already been asked for advice on analogous topics already if you wish me to comment on them.

Q109 Dr Harris: I know you issued a report to Alistair Darling on strategic decision making and technology policy that highlighted six key technologies, including plastic electronics.
Professor Dame Janet Finch: Indeed.

Q110 Dr Harris: I understand plastic electronics has not gone so well.
Professor Dame Janet Finch: I think there are still opportunities in plastic electronics. I understand this Committee has already undertaken a study of that to which one of the CST members actually gave evidence to you. The outcome that particular strategic decision making study was also to produce a methodology that can be used in other circumstances. We were invited by Alistair Darling when he was Secretary of State at the DTI to advise him on how to prioritise technologies which could come to market within five years. That was the particular examination question that he put to us. In the process of doing that we produced a methodology that can be used to answer a slightly different question in terms of prioritisation and that is a methodology which we would definitely advocate government to use in other circumstances.

Q111 Dr Harris: We do not have time to go into this now, but would you be willing to drop us a note to let us know how you think that earlier report has been implemented.

Professor Dame Janet Finch: Yes, certainly.

Q112 Dr Harris: I want to move onto evidence based policy making. We have issued a report previously on evidence based policy making and we pointed out that policy is not dependent on evidence; sometimes you have manifesto commitments, you have ideology and economics which trump those and that is legitimate, this is a political place. However, one thing we were very clear on is that when a policy was described as evidence based it ought to be evidence based; you should not ignore the evidence. You should not do it for these other legitimate reasons and then still call it evidence based because that undermines the vocabulary. Do you agree that that is a reasonable recommendation, suggestion and guideline for the Government to follow in policy areas?

Baroness O'Neill of Bengarve: Yes it is reasonable and a lot lies behind that. I noted that the CST report that was launched last night reminds us that government put £2.8 billion directly into hiring consultants, including consultants who provide research.. That is a huge amount of research spend and I think it is a very legitimate question for all of us whether it is best spent getting the right evidence at the right time. We know that the relationship between academia and the Government is not entirely happy and this report has made many useful suggestions on how to improve it, as has the earlier report by Sir Alan Wilson which the British Academy produced. However, in the end a lot of what we have to look at is what are the incentives. I think the CST report addresses the question of the incentives for academics, where policy engagement does not bring peer review kudos, but we need also to look at the incentives for policy makers and civil servants. There are a lot of ways in which the commissioning of government funded research could be made more rigorous. I am not sure this is the context for approved lists of suppliers; I am not sure that it should not be a requirement to say that this was or this was not peer reviewed; and to spend some of the money on seeing whether the policies that then were implemented—both the regulation and the legislation—were effective, ineffective or counter-productive. Social science research can do a lot there, but government needs also to have the incentives to want to have evidence based policy.

Q113 Dr Harris: I am at a slight disadvantage because I have not seen this report and I do not think we were invited to the launch last night.

Professor Dame Janet Finch: I do apologise for that; that was an omission that has been pointed out to me.

Q114 Dr Harris: Coming back to my question, do you agree with our recommendation about the importance of keeping the vocabulary honest about what is evidence based policy?

Professor Dame Janet Finch: Certainly. We would absolutely recognise that government, as you say, has a number of different considerations where policy is being made, but if it wishes to base that policy on evidence then it should be robust evidence.

Q115 Dr Harris: Advisory committees are best constituted if they include social science as well.

Professor Dame Janet Finch: Yes.

Q116 Dr Harris: I just want to take one government department at random, the Home Office, and the way they treat scientific advice. In respect of the Advisory Council on the Misuse of Drugs which contains social scientists, hard scientists and clinicians and indeed police representatives, they gave very clear advice twice about the classification of cannabis and the Government rejected that advice, as governments are entitled to do. However, the Government, when rejecting it, did not say that they were doing it for other reasons; they said that the Advisory Committee had essentially got the evidence wrong and had not looked at key things that the Government had looked at. Given that the Government appoints the Advisory Council on the Misuse of Drugs do you have any comment on whether it is likely to be true that the Advisory Council just did its job badly and looked at the wrong evidence or appraised the evidence wrongly, or would you say that might be an example of where the Government has a non-evidence based decision that it wants to disguise as an evidence based decision?

Professor Dame Janet Finch: I do not know. I have not studied the detail of that. It is always possible that advisors to government do not consider the full range of evidence. We have to accept that that can happen which is why I emphasised in my last answer to you that all evidence must be very robustly based. One would hope that scientific advice always is, but you have to accept the possibility that it sometimes is not.

Q117 Chairman: Baroness O'Neill?

Baroness O'Neill of Bengarve: I do not know the particularities of the case but it seems to me that clarity is achieved by making the advice available on a routine basis unless there are particular reasons of commercial confidentiality or security why the advice cannot be made available; and it is indeed open to government to say, "In this case there were other considerations which led us not to accept the advice". If it is advice you can refuse it, but I think it muddies the waters if people mix up their decision with what the advice did not say.

Q118 Dr Iddon: In 2006 the House of Commons Science and Technology sub-Committee recommended that government should make more use of the tremendous expertise that lies with the learned societies, academies and professional organisations in general. Has there been any progress following that advice we gave in 2006 that you can detect?

Ms Britton: There has been increasing engagement on this. Certainly now we have a lot of engagement with the Royal Society. Lord Rees mentioned the work they are doing on crop productivity which is feeding into Food and Farming Futures Foresight project. They are also, for instance, together with other learned societies looking at synthetic biology. The Royal Academy of Engineering is also looking at the definition of synthetic biology; how can we get hold of this thing so we can look at it to see how we can look forward and anticipate, as with nanotechnologies, what the Government needs to do to encourage the right things and proceed to regulate where there might be unnecessary risk. They are getting together with us to look at those kinds of areas. I think the GSRU—the Government's Social Research Unit—has been engaging with the British Academy and other learned societies on the humanities and social research side to see how better they can engage together. I think there is quite a lot of this going on and also with smaller learned societies as well. The Health and Safety Executive have people like the British Toxicology Society and the British Psychological Society and so on to actually try to draw out of them things that can help; the Ergonomics Society and so on. I would also say that now that we have rather more of these CSAs and most of them come from learned societies where they have generally been very active at the top of them so that is another route in, and also a networking route out to actually engage with the societies' members further.

Q119 Dr Iddon: I have a few questions on the way the Government consults organisations. Baroness O'Neill, the British Academy is concerned that the Government's public consultations are not always carried out to the highest social science standards. How can we improve the process?
Baroness O'Neill of Bengarve: I think it is quite difficult for government to improve it, but there are, nevertheless, questions and they begin with a matter of timely working, of a degree of anticipation of when you may need evidence from a particular area and then, as it were, the first order inquiry is to find the people from whom you are going to get advice as to which bodies or which particular researchers might have useful input. You and I know that sometimes these consultations are ridiculously rushed and poorly constructed, but it is possible to do better and I think that one of the ways we can help it happen is to do more to knit together the policy making community and academic community with quite focussed meetings. For example, on Monday the British Academy has a forum where we are getting academics who work on different conceptions of democracy that have been important in Britain with policy makers, to go through how they wax and wain and what influence they have or might have. That would be one example. We are doing one on international relations and conflict later on. I believe we need on-going relations between government departments and relevant researchers so that when somebody finds a problem looming they know roughly where to begin; not to get the advice but to find the people who can give advice on where there is good evidence, where there is not good evidence and, above all—and I take this to be very important—where the desire for evidence for a certain type cannot be satisfied, it is not feasible to get the evidence.

Q120 Dr Iddon: Can I ask Judy Britton also how you feel we can improve the way that government consults?
Ms Britton: I think the word "consultation" can cover a multitude of different things. Consultation is often very open and asking anyone who has views—not necessarily evidence, but views—in a particular area and reasons for having those views "please come forward and say that". So you do get a vast conglomerate of stuff, as it were, which covers politics as well as evidence, if you like. They are very broad. If you are trying to do a focussed study you do have to target people a lot more. If you are doing something like a Foresight project you will very much target but go for a very wide field of expertise—globally as well as nationally—but actually get people to write papers and so, not just ask for their views. It is very clear, it is stronger than a literature search but is really looking to find all the expertise that there is there and then coming to a conclusion on the way forward. I suppose what I am saying is that there are different extremes in consultation and I think the Government could focus sometimes and think what kind of consultation are we going for here rather than asking for different kinds of things in the same basket.

Q121 Chairman: Coming back to that, the Institute of Physics said to us in a previous session that GO-Science needed to develop a clearer strategy and focus and that in fact it needed to be much more proactive in shaping debate across to Whitehall. Indeed, I understand that the CBI has been particularly critical of GO-Science. Do you think that that is a fair criticism? Should you be more proactive? Should you be higher profile?
Ms Britton: I think we should certainly be pro-active in key areas where we can add value. This is one reason why John Beddington has set up this enhanced global issues team.

Q122 Chairman: We do not hear anything about it.
Ms Britton: A lot of the work that GO-Science does is within government. We do not necessarily preach from the rooftops; we have a lot of committees that we coordinate, sit on and so on where we feed advice in at the official level as well as John working with permanent secretaries, sitting on EDSI and various other cabinet committees. These are not things that appear in the public eye and I think one would not necessarily expect them to at all but we are very proactive.

Q123 Chairman: It sounds like the Kremlin.
Ms Britton: Why? We are civil servants working within the Civil Service.

Dr Bradshaw: We have very good relations with Professor Beddington; he came to one of our committee meetings last year and we had a very good debate with members there about some of the big challenges facing the planet, the economy, the environment, health and whatever in the future which we found very interesting. One of the challenges we have had recently was with the horizon scanning part of GO-Science mainly because they seem to have been quite constrained in terms of the modelling that they were doing, whereas business might think, looking at some of the real shocks in terms of changes to the oil price and things like, it was apparent that some of the modelling they were doing was rather more constrained because that is what government ministers would expect and they did not like the idea of looking at really extreme examples of what might happen. Broadly we have not been critical of GO-Science.

Chairman: You have been able to put the record straight.

Q124 Dr Iddon: I have been rather critical of the way government carries out consultations myself and so annoyed by the way it does it. For instance, launching consultations just before Christmas or just before Easter when there is a three month response time. A number of organisations have written to me and said that this is wrong, they just do not have time to get their act together. On another front, do you think that government consultations are meaningful? Are they box-ticking exercises with pre-determined outcomes? Or are they genuine consultations in which government is prepared to listen to the responses?

Dr Bradshaw: I think it is mixed. There are bound to be some that are box ticking exercises but there are definitely some where there is a real willingness to engage and listen. I think Lord Sainsbury's review was a very good example of government willing to listen and engage properly with organisations like the CBI, the Technology Strategy Board and other representative bodies, whereas there are some others where you might find that the CBI, for example, is counted as one despite the fact that we are representing a large proportion of industry and then we might only have the same weight as one learned society or one university. So you end up with a list of people who have responded to the consultation which is 97 universities and 50 professional societies in the CBI. So our voice in that might not actually be given what we think it should be. It is mixed; they are not all bad, they are not all brilliant.

Q125 Dr Iddon: What is the last one that you personally were involved in? What was your experience of it?

Dr Bradshaw: I cannot remember; I will have to come back to you on that one.

Q126 Dr Iddon: Professor Finch?

Professor Dame Janet Finch: I do not think that the CST has a view on government consultations as such. We have done a substantial amount of work on public engagements—you might think that that was one form of consultation—and we produced a report in 2005 called *Policy Through Dialogue* where we recommended that there are examples of very good practice within government of getting this right. This is in areas where there is an inherent public anxiety about some new technology or medical development and where government genuinely needs to understand what the public are thinking and perhaps take that into account before deciding which direction to move in. It is not quite the same thing as consultation but really engaging people in a genuine understanding of what the issues are before they react to it. We produced some recommendations about good practice and the Government did actually accept not only our recommendations but also a specific aspect of that which was to establish an expert resource centre which is there within GO-Science now to advise across government on how to do this well. Three years on we are now reviewing the consequences of that and we are still undertaking that piece of work—we have not completed it yet—to see whether the impact of that advice has been positive in the way in which government does public engagement across a range of different topics. We are very interested in how that happened; it has a particular resonance for the development of science and technology and the development of science based innovation.

Q127 Dr Iddon: Thank you. Baroness O'Neill?

Baroness O'Neill of Bengarve: I have my own favourite amazingly bad consultations. I think my favourite was a Home Office one called *Footprints, Fingerprints and DNA Samples* issued in July to be returned in September; it had a certain glory. However, I have seen some useful bits of work of this sort. For example, when I was on the Royal Academy of Engineering and Royal Society nanotechnology and nanosciences group we commissioned a bit of work and we found out that at that point 29% of the public knew the word "nano" in some context and 10% of the public knew it meant "very small". It was very useful to know that, but whether it was value for money would be another question. There are, of course, consultations which are essentially professional exercises and you get a lot of responses of that type. I think they are very important because one hears the different positions that people have. Nevertheless, that is very different from consulting the public at large and I think one of the things that bedevils this area is the assumption that there is a class of entities called 'stakeholders' which runs from individual sixth formers to the CBI for the same consultation. I think that good practice would suggest horses for courses here, and value for money all the way. Ask first: what do you wish to find out?—not the answers, but generically—and: Will you find it out by this method?

Q128 Dr Iddon: Could I continue with you, Baroness O'Neill, and ask my final question? Following the consultation, do the people who have taken part in it get enough feedback from the Government?
Baroness O'Neill of Bengarve: My experience has been that they do not get feedback. If you are an institutional respondent you can often, by looking at the paperwork of a select committee or other body, discover quite a lot; but I think feedback is unusual. This is a very interesting feature of society with its supposed commitment to transparency and communication, that information is fed up but nobody knows, on the whole, whether it is listened to, understood or acted upon.

Q129 Dr Iddon: Can I put that question to you, Tim, as well?
Dr Bradshaw: We do not get feedback as such but we monitor what happens in terms of whether there is change in government policy or in the implementation of policy. Sometimes it would be nice to have feedback; it would save us having to trawl through various papers and documents and things to find out what is really going on.
Ms Britton: I should add that best practice on government consultation is that there is clear feedback and you can actually see the results of the consultation. Those are supposed to be published at the end of the consultation.
Dr Iddon: We could not agree with you more.

Q130 Dr Harris: They are not always published though, are they?
Professor Dame Janet Finch: I think one of the most recent consultations that CST has been involved in is a formal consultation with the consultation actually within DIUS about the science of society policy area. As I recall the outcomes of the consultation were published and widely made available for that. So that is an example of good practice.

Q131 Graham Stringer: You have talked about consultation and advice. Scrutiny is a more difficult word in some ways. Do you see it as part of your role to scrutinise government science policy?
Professor Dame Janet Finch: In the sense that scrutiny has a technical meaning, no; that is not part of CST's terms of reference. We do see it as part of our role to consider the impact of what government has done in various scientific areas and to analyse that and to advise on further work. For example, Lord Rees in the previous session mentioned the Royal Academy of Engineering and Royal society study of nanotechnology and Baroness O'Neill has just mentioned that she was involved in that. As part of the Government's response to that report they indicated that they were going to ask for an independent review of how they had progressed to recommendations three years on. CST was actually asked to undertake that review which we did. It is not exactly a scrutiny role—that one was actually at the request of government—but we are very happy to look at government performance in relation to a particular set of objectives that government had set itself and to make comments about how well it had performed against those.

Q132 Graham Stringer: In a sense a lot of what this Committee does is to scrutinise government science policy. Do you think that overall the scrutiny of the Government's science policy could be improved? If so, in what way?
Professor Dame Janet Finch: It is difficult ever to say that something could not be improved. I think that the range of ways in which this Committee and CST in a different way and other bodies have the opportunity to comment on science policy is actually quite extensive and quite varied. We have a good level of public debate about science policy in this country. I could not deny that there might be ways of improving it but I do not have any specific suggestions.
Baroness O'Neill of Bengarve: I think public scrutiny is important and quite difficult and that this Committee and the Science and Technology Committees do, on the whole, a good job. However, we have to recognise that we work against a background which sensationalises science in ways that are quite maverick. If you read, for example, the POST (Parliamentary Office of Science and Technology) report on the media coverage of GM in 1999 one sees there a very good case study of how a bit of science policy was completely taken over by rather populist and hysterical writing about certain aspects of the issue, with profound effects on the science base of this country, particularly in plant sciences. I do not now how to resolve this one because those who do responsible scrutiny only hold a few of the levers. However, I still think responsible scrutiny is really important.
Dr Bradshaw: You would expect me to say this, but if we had a little bit more input from the user side of science and engineering—from the business side of it as well as the professional and academic side—then that would help to rebalance things.
Ms Britton: On the scrutiny side of things John Beddington, before he was Government Chief Scientific Advisor, was chair of the Scientific Advisory Committee in Defra. He is championing the idea that there should be these kinds of councils throughout government departments—the Home Office has one which representatives of learned societies sit on as well as the chairs of their scientific advisory committees. The idea is that they take a view across the department at a strategic level and can see what is going on, critique it and challenge it. He thinks these are a very valuable form of more internal scrutiny than a select committee.

Q133 Graham Stringer: When you are carrying out an internal scrutiny of different government departments, how responsive are they to their review findings?
Ms Britton: I think they are responsive. They are usually responsive to a few high level recommendations and that is one of the reasons why we have been looking at changing the way we do the

science reviews because you can come up with a very long list of recommendations and that is too much for people to take in. If you give them two or three really key things to do then they will follow those. I think we would have a lot more hits in doing that. They have been receptive, yes. They are very helpful during the reviews and receptive in actually taking the recommendations forward.

Baroness O'Neill of Bengarve: I would like to mention that one of the very simple things in this area is the question of knowing what your own department has done before, and as we know a number of departments in Whitehall do not always have a good memory of past policy initiatives, what worked and what did not work. In that context I think there is room for an extension of a rather valuable new website called *Historyandpolicy* (one word) which provides policy orientated papers by historians but I think it would often be extremely useful if those who know what worked and what did not work in the quite recent past were there to say, "By the way, you tried this in 2002 and you gave it up for the following reasons". Simple information is often useful information.

Q134 Graham Stringer: We should stop inventing the wheel.

Baroness O'Neill of Bengarve: Yes.

Q135 Graham Stringer: Judy, in terms of what you have just said, can you give us some examples of where departments have taken on recommendations?

Ms Britton: One that might be pertinent to the discussion today is that we have talked quite a bit in the various reviews about the role of social science and indeed the 'harder' scientists and the social scientists within government coming together because working together can actually strengthen policies considerably. I think that has been taken on board in Defra, for instance; they have strengthened things. In CLG they are actually bringing the hard scientists and the social scientists who tended to be in separate pots just looking at particular areas and they are now getting together and getting really effective results. Similarly in the Home Office again this idea that hard scientists in one place and the social researchers are in the main building, actually bringing them together I think is a particular area where people are working
quite hard to improve.

Q136 Dr Harris: A lot of government scientific advisors like yourselves are still research active and published and you are a distinguished academic yourself in your field, do you worry that if you publish something the *Daily Mail* might say, "Leading government advisor says families doing this, that or the other in terms of their inheritance" implying unfairly that this is now government policy in some way. Do you worry about that? Do you think other people worry about that who are also independent government scientific advisors?

Professor Dame Janet Finch: I would not worry about that, no. Someone in the previous session said something similar, that that can happen in any event. In the study that we did about how academics and government can work more closely together we did actually find that that this is an anxiety which some academics have. It is one of the impediments to more academics becoming involved in government, that people are concerned that if they produce work which has policy relevance and it has more high profile in a policy context that their work may be distorted to their disadvantage. I would not worry about it personally but it is definitely one of the issues that need to be overcome if we are going to get more academic input.

Q137 Dr Harris: You would expect the Government to stand by them and say, "Look, this is academic freedom".

Professor Dame Janet Finch: Of course.

Chairman: On that positive could I thank our panel of Dr Tim Bradshaw, Professor Dame Janet Finch, Judy Britton and Baroness Onora O'Neill. Thank you very much indeed for your evidence this morning.

Monday 16 March 2009

Members present:

Mr Phil Willis, in the Chair

Mr Tim Boswell
Dr Evan Harris
Dr Brian Iddon
Mr Gordon Marsden
Graham Stringer

Witnesses: **Professor Adrian Smith,** Director General for Science and Research, Department for Innovation, Universities and Skills, **Nick Dusic,** Campaign for Science and Engineering, **Professor David Edgerton,** Imperial College London, and **Professor David Charles,** Regional Studies Association, gave evidence.

Q138 Chairman: Could I welcome our Panel of very distinguished witnesses this afternoon, welcome to you all. It is our first meeting with you, Professor Smith, so we are delighted you are here. We hope you are enjoying your role and you will enjoy this afternoon even more. If I could start with you, Professor Smith, the government is conducting a major debate at the moment to consider the strategic focusing of what it calls targeted research programmes. First could you tell us what you understand by targeted research programmes, and do you actually support the government's move in this direction?
Professor Smith: Can I take you into the slightly wider context? When I came into this job there was some kind of legacy of dissatisfaction with the way that consultation processes took place in looking at priorities, in particular in the build-up to Spending Review, so one of the first things I did with the support of ministers was to say we should have a more public, as it were, consultation process, and I have listed a number of bodies—the Royal Society, Royal Academy of Engineering, et cetera. That originally was thought of in the context of a lead-up to a Spending Review, but we do not have a timetable for a Spending Review and we do not quite know when and how that process will take place, but I think what we were trying to do there culturally was to up-the-ante on a consultation and debate about priorities of every shape and form. So I think what Lord Drayson has been doing coheres entirely with that kind of strategy of seeking to be much more consultative and get views from a wide variety of sources on priorities.

Q139 Chairman: So it was all planned?
Professor Smith: Compatible with the planned process that I set in motion when I took up the job.

Q140 Dr Harris: Before you develop that question, Chairman, the fundamental question, it seems to me, is that this is not a consultation or a debate on whether we are going to target research money on certain strategic areas, it is only about which areas. Could you clarify whether that is your understanding? Because I think during the recess the Secretary of State did make clear at a meeting that Nick Dusic was at that it was not a "whether we are going to do what Lord Drayson first canvassed", but "how we are going to do it". Is that your understanding?
Professor Smith: No, I do not think that is my understanding. If you look at the speech that Lord Drayson made at the Foundation for Science and Technology, it generally reiterated several times that he wanted a debate and a consultation. The communication he has had with various bodies, including Royal Society, Royal Academy of Engineering, and with Martin Rees and John Brown has made very clear that he is genuinely seeking views on that whole set of issues. There is from my perspective no plan in place that there is going to be radical re-targeting.

Q141 Dr Harris: So the key question is if all those organisations which you have mentioned which those individuals represent say that this is a bad idea then it might not happen?
Professor Smith: Then I am sure Lord Drayson and others will be very interested to hear that response.

Q142 Dr Harris: Sorry, but that was not an answer to my question. So there is a possibility that this refocusing of research on strategic lines might not happen if everyone thinks, or significant enough people think, it is a bad idea?
Professor Smith: I think we have to wait and see the outcome of the consultation.

Q143 Mr Boswell: Just to get a flavour of the consultation process, you have mentioned the great and the good within the world of science and engineering, the Royal Academy, the Royal Society, et cetera. How much do you think it is important to try and reach down either below that or behind that, perhaps, to canvas the views of bench scientists and people who may well feel, as I think some of them do, very intensely about the situation of responsive mode funding? I know we are not discussing that now but how much can you maybe say a multifunctional consultation, rather than a matter of going to see the usual suspects who will have views that you probably well know anyway?
Professor Smith: Taking up the last point, "the usual suspects' views", I do not think they are the usual suspects' views. My original idea of going to bodies like the Royal Society, the Royal Academy of Engineering and so on is that there you have high level councils who have people seeing things from all perspectives. The problem with going to see the biologists on Monday and the physicists on Tuesday is that those would be the usual suspects and you

would know what they would say, but in addition to the bodies I name there is a continuing dialogue all the time with the Research Councils, and I do not know anybody out there whom you would describe as a bench scientist who does not take any opportunity they can to bump into me and tell me what they think.

Q144 Chairman: The fundamental issue for us here is this issue of targeted research programmes, they are the words Lord Drayson has used, so however we got to that point of targeted research programmes my original question to you was what do you understand by "targeted research programmes"? Can you let me have the answer to that as briefly as possible?

Professor Smith: My understanding of the original debate that he launched was should we be folding into the prioritisation process the dimension, and I think he listed three aspects to that dimension, about tensioning, in a sense all other things being equal, against where we have potential industrial growth capacity, potential to be world-leading, where we have those kinds of opportunities feeding off research, ought we to be thinking more about focusing in those areas?

Q145 Chairman: That is what you mean by "targeted" priorities?

Professor Smith: I think the original word was "focused", and that that process of prioritisation and focus, thinking perhaps more consciously about where there is potential industrial pull-through, where the United Kingdom can be a leader.

Q146 Chairman: Can I ask the rest of the Panel, is that your view, briefly?

Professor Edgerton: I was nodding because the argument is a very familiar one. It goes back many, many decades, this hope.

Q147 Chairman: So this is not new?

Professor Edgerton: It is not new in the slightest. What is novel is that since Lady Thatcher's time we have lived in a political world that has refused to pick winners in industry and the economy more generally, so we end up with a rather paradoxical situation where ministers are trying to plan science and research, whereas they refuse the opportunity to plan the wider economy or industry, and I think that is probably exactly the wrong way round.

Q148 Chairman: So your view is that government is trying to plan research?

Professor Edgerton: It sounds like it. The problem is that is not really possible and I do not think government has made any serious attempt to plan science in the last 20 or 30 years, but the rhetoric of planning science in relation to industrial development has been central to the arguments certainly from the mid-1980s. Twenty years ago I remember writing an article on Mrs Thatcher's science policy and it was examining exactly the same kind of argument.

Mr Dusic: There have been three different speeches. We have had Lord Drayson's, John Denham's and the Prime Minister's speech, and each has a different focus on this issue. The Prime Minister has said they will be running increased investment across the board in science, and that was to be welcomed, but Lord Drayson's and John Denham's had an inherent question if we increase research in certain areas and focus on those areas that would be potentially at the expense of others. From the Campaign for Science and Engineering our perspective is that that breadth of excellence that exists within science and engineering within the United Kingdom is one of our core strengths, it gives us a competitive advantage against other countries, and we need to be able to have a strong and excellent research base going forward that is able to deal with new challenges and new industrial opportunities that we should not be getting into a narrowing of the focus of the research base at this time.

Professor Charles: One point that comes to me is thinking back to the technology foresight programme a few years ago, which was meant to identify these kinds of priorities and areas of strength, something which was central to that were these panels at a national level who were trying to identify where the United Kingdom strengths were and where the investment therefore ought to focus. Largely that was not followed through in terms of actual direction of funding for research, but these things tend to be done at a national level and I think what is interesting was whether the different parts of the United Kingdom felt they were being represented effectively in that approach, and certainly I remember being involved in some regional foresight activities at that time and the feeling in the north was that these panels were representing a national view and not necessarily the opportunities and strengths at a regional level within the United Kingdom. If you try to second-guess what the strengths are at a national level the danger is that you do not represent the full set of opportunities that might exist across the United Kingdom.

Q149 Chairman: I really would like to get a straight answer from you in the sense of these targeted research programmes, because this is the area of which you are the director. You are responsible within government for delivering the research budget—yes?

Professor Smith: Yes.

Q150 Chairman: So when we talk about these targeted research programmes, does that mean to you basic research as well as transational research? What does it mean? Is it all research?

Professor Smith: I rather boringly come back to the point I made before which is that what is in process is a debate and a consultation, very wide-ranging, about whether there is potential and need for more focus which takes more into account, if you like, the economic pull-through opportunity. That is a legitimate question raised by Lord Drayson which he has asked.

Q151 Chairman: What is your view?
Professor Smith: I would be very interested to see what the results of that consultation are.

Q152 Chairman: You do not have a view?
Professor Smith: I think some aspects of this are going off in a slightly wrong direction. We have a broad portfolio of ways we invest in research and stimulate research and its pull-through into innovation. In addition to the mainstream work of the Research Councils there is a substantial amount of Research Council money is brokered through the TSB, linking with Regional Development Agencies into another agenda.

Q153 Chairman: Can I just stop you here? This is a fundamental issue we are trying the get at, whether in fact this research is now being targeted, because "targeted" means you actually focus on something as part of a deliberate government policy to put our research efforts into particular areas, and Lord Drayson, to be fair, has actually mentioned those areas, and I am asking you, is this going to be right through the whole channel, right through from basic research coming out of our Research Councils to what the dual support system funds as well? Is that your view, as to what we are talking about?
Professor Smith: No, I do not recognise that direction of travel. We have in the last spending round the major cross-cutting themes across the Research Councils—Living with Environmental Change, aging, energy, national security. One is talking as though suddenly from nowhere—on a blank sheet of paper—these are extraordinarily new things. We already have strategic focus on certain major challenges for the country and for the economy, and we have mechanisms through cross-council funding for dealing with those. We have mechanisms for linking with regional agendas through the TSB, Research Council and RDA money; the questioning is as though this is some kind of bolt from the blue something we have never talked about before. It is part and parcel of something that is out there in the spectrum of the agenda already, and if you look in detail at the deliberate wording in the Prime Minister's speech he talks about the need for a broad base in science and protecting fundamental science.

Q154 Chairman: There is a huge contradiction between a broad base in science and targeted areas of research. The two take us in different directions, do they not?
Professor Smith: No. Living with Environmental Change is a targeted challenge to which a broad sweep of disciplines contributes. Entirely compatible.

Q155 Chairman: Am I missing something here?
Professor Edgerton: It has been very difficult to pin down the real meaning of policy statements in the area of science policies, in the plural, for very many decades, so that is not novel either.

Q156 Dr Harris: We do not have to look back decades, do we? We have a speech. We have no Green Paper, no White Paper, but three speeches. I was interested that Professor Smith said the debate is whether we do more strategic focusing, and I accept your last answer, by the way, that there has already been some tactical focusing on themes which may attract a broad range of basic research. So I would like to ask Nick Dusic, who did hear the answer to a question that was raised when John Denham spoke at the Academy of Engineering, do you think the debate is about whether we focus on certain "strengths", or is it about the degree to which we focus more? What is the debate? Is it whether or is it which/how?
Mr Dusic: Interpreting the different speeches is very difficult, but John Denham was pretty clear when he said "The debate is over, it is how we do it", and the debate now is how we engage with partners and how it goes forward. Drayson's debate and lecture was much more about let's have a debate about these issues; John Denham's said we are moving this debate on and we are going to discuss how we focus on different areas, and the Prime Minister again talked about focusing of research. So I think there has been a lack of clarity but it does sound like the agenda is moving forward.

Q157 Dr Harris: Professor Smith, responding to that, was that just a misunderstanding? Did the Secretary of State mis-speak when he said it is not about whether—because I was there too and it was my question actually—it is only about how and which? Did he mis-speak, or is there some rowing back now to the Prime Minister's speech where it was much less specific or to your understanding?
Professor Smith: I think if there were some rigid set of decisions already made there would not be the very genuine consultation and debate that is going on at the current time. As I said, we do already have quite a number of major challenges themes.
Dr Harris: But Lord Drayson did not say he was going to do more of the same.
Professor Smith: He did not say he was not, either.

Q158 Dr Harris: But he said it was a radical change. He talked about Singapore and Finland and us doing something different than we have done before, whether or not we have thought about doing it before, so—and I am not criticising it—I just want to know whether it is worth anyone saying "do not do it", or whether we should now only be arguing about which areas should have the strategic focus. Do you understand the difference?
Professor Smith: Yes, and I would expect that there would be some comeback from the consultation that says: "Don't do it" and there will be other views, and we will have to see where we take it from there.

Q159 Chairman: Would you prefer the consultation to have been on the back of a Green Paper or a White Paper so we clearly understood the structure which we were actually debating? And is that not your job to do that?

Professor Smith: In the current circumstances, because we are in a serious situation, I can quite understand why people, when they think something needs debating and consulting, try to get it out there and get the consultation started.

Q160 Dr Harris: Are you saying because the recession makes it urgent?
Professor Smith: I think it changes slightly the context for everything. It does bring everything into focus, and I remind you the original word used was "focus" the debate.

Q161 Dr Harris: But I understood this was a post-recession policy, because this is going to take some time to sort out, if it is agreed and if it is decided.
Professor Smith: From this perspective the two are the same, are they not? The recession necessitates the view that as one moves through it the world is going to change and the landscape is going to change, and the genuine question is should we think a bit about what that landscape would look like and whether we have the right kind of focus?

Q162 Dr Harris: To move on, my understanding from your answer is that it is not too late for people to say "Don't do this" in their response to this debate; it is not a given. If that is wrong and if the decision has been taken you can write to let us know, but you have been pretty consistent that that is still an "if" not just a "how" question. It may well be a "how" as well because it may well be you are going to go down that path, so the question is how are you going to handle those areas which lose funding? In response mode funding, assuming there is a decision, and I know we are painting a scenario now but it is one we have been invited to paint by ministers, to concentrate in certain strategic areas, then clearly you will have to de-concentrate on other areas if it is going to be any sort of sizeable shift, on other areas. How are you going to handle that? What thought has been given to handling those areas where success rates for responsive mode funding applications drop from 20% to 5% in order that others might be expanded?
Professor Smith: We are not in that territory, are we, and you will know just from the mechanics of how the Research Councils and research grants and forward investments work that we are looking at some period ahead to where there would be slack in the system, as it were, to start rethinking where we put—

Q163 Dr Harris: How long do people have? If they feel they are in a discipline that has not got the historic good research that might count, or is not in one of these opportunities that has been mentioned, or is otherwise likely to be mentioned, how long do they have to change their career focus?
Professor Smith: I do not think that is the appropriate question because, as we said before, if you look at those speeches you will see time and time again reiterated the need for a very broad research base and a fundamental research base. Something like *Living with Environmental Change* sounds a very applied focused project but actually there are huge amounts of fundamental research across a multitude of disciplines that feed into. So just raising this kind of debate does not lead down a track which says that certain disciplines or certain kinds of research are not fundable any more.
Mr Dusic: The government needs to be really clear about what it is doing going forward. We have other countries that are making a big investment in science and engineering at the moment, and if there is uncertainty about what the United Kingdom is going to be doing, we want to be able to track and maintain leading science engineers from a wide variety of disciplines, but I think they need to be very clear about what they are planning. Just in terms of narrowing the research base there is a lot problems if that is the direction that they go down.

Q164 Graham Stringer: Professor Edgerton, returning to your answer previously, I am not sure I understood it and I would like you to expand. Are you saying that if the government chooses not to pick winners in industry it cannot pick winners in science?
Professor Edgerton: Yes.

Q165 Graham Stringer: Can you justify that?
Professor Edgerton: Yes. What I mean is there is a plausible nationalistic policy of investing in certain industries because you feel you need to be strong in them. I think it is much more difficult to do that successfully in research simply because the future of research is uncertain; you do not really know where it is going to go. If you want to build a supersonic aeroplane or a gas-cooled reactor you have a pretty good idea that you will be able to do it and you will get some energy out of it even if it turns out to be very expensive. I think there is a conceptual difference between going for an industrial policy that picks a certain sector to invest in and a research policy of a potentially analogous sort.

Q166 Graham Stringer: I do not want to over-interpret it but you are really saying that the government has an impossible policy, and that what it is saying is not achievable?
Professor Edgerton: Yes. I think it does not make sense to have a policy in which you stimulate a particular area of academic science, which is fundamentally what we are talking about, on the grounds that it is needed to develop a certain kind of industry that the United Kingdom is going to have if you do not have a policy for developing and maintaining that industry. It simply does not make sense.

Q167 Graham Stringer: So if one could take what I hope would be a realistic instance like trying to develop hydrogen fuel cells to move towards a hydrogen economy, you are saying there would be no sense in doing that unless you stimulated the whole of the automobile industry, or some equivalent end-user?

Professor Edgerton: Exactly, if you take a view as to how you are going to ensure that the automobile industry takes that up, but we obviously live in a very international world both in the basic science of fuel cells and automobile production, so I think unless you think through all this very careful there is a very strong likelihood of what you are indicating, which is that you are on a hiding to nothing here.

Q168 Mr Marsden: Could I focus the Panel's attention on the Haldane principle? Now the vast matter of the evidence we have received cites support for the Haldane principle; the only problem is they all seem to think it means different things. United Kingdom Computing Research have said they support the principle as originally stated; CaSE have said there was no agreed definition; and DIUS we are told supports the thrust of the Haldane principle. So I wonder if I could start off with you, Professor Edgerton, and ask you as one historian to another to give us very briefly why the Haldane principle has come about; has government mucked around with it since 1918, and what is your understanding of what it means today?
Professor Edgerton: The headline is: "There is no Haldane principle and never has been", and if there has been something like it it was not created in 1918 by Lord Haldane but rather in 1964, I think, perhaps a little bit earlier, by another future Lord Chancellor, Lord Hailsham. He created it, I think, as an argument against the then Labour Opposition, who in his view wanted to do things to the Department of Scientific and Industrial Research, as then was, that he did not approve of. If I may just read very briefly Quintin Hogg, as he then was, in the House of Commons, on the Ministry of Technology: This was a totally newly departure from recent practice and in my opinion at least is a most retrograde step. Ever since 1915—"he is correct about that"—it has been considered axiomatic that responsibility for industrial research and development is better exercised in conjunction with research in the medical, agricultural and other fields on what I have called the Haldane principle through an independent council of industrialists, scientists, and other eminent persons and not directly by a government department".

Q169 Mr Marsden: It is an anti central planning thing, basically; it is a credo for: Don't get your mits on planning science and technology.
Professor Edgerton: It is anti central planning and anti, as the argument for DSIR originally was, having a normal government minister, if I can put it that way, in charge of research. You need a senior person outside the usual administrative run of departments, the Lord President of the Council notably, to take a very broad view of what was of course only a very small part of the total research investment of government. So that is one element. The other element that is already there is this notion that scientists themselves control the research agenda, but that is a very different concept, not in Haldane either.

Q170 Mr Marsden: So how does that fit in with how John Denham told us he interpreted the Haldane principle today? He said: "Research is the best place to determine detailed priorities. Government's role is to set the over-arching strategy. Research Councils are guardians of independence of science. These should the basis for Haldane today." Does that have any link with what has previously gone on?
Professor Edgerton: I do not think anyone has ever thought of the research councils as the defenders of the independence of science—that is a very odd definition indeed and I hope we have not actually got that. Learned societies, universities and individual academics are the custodians of the independence of science. The other point is they do not have any particular grip on the issue of the management of science let alone whatever the Haldane Principle might be.

Q171 Mr Marsden: Could I then just turn to you, Professor Smith, on the back of the historical exegesis that Professor Edgerton has given us? Does it suit the Government to keep Haldane vague? Professor Edgerton said it is a bit like the peace of God, it passes all understanding; is there a succinct view of what Haldane means in the department today that you can give us?
Professor Smith: I can certainly make it succinct. Whether or not there is a Haldane Principle, the very clear separation where high level research councils make proposals to Government during spending reviews, draft the delivery plans, these are debated, Government allocates funds and then once those funds are allocated, does not interfere in the scientific decisions as to how much goes to Professor X and Professor Y seems to me a very valuable, practical separation of powers, whatever you call it. The Government is certainly committed to that and sees it as a valuable part of the landscape.

Q172 Mr Marsden: I want to bring my colleague Brian Iddon in in a minute, but just briefly since we have you here, Professor Charles, of course they certainly did not have regional policy in 1915 or 1918 and it is arguable how Wilson's Government really thought about regional policy in the Sixties, but is Haldane as discussed today a hindrance or a help in terms of articulating regional policy?
Professor Charles: Those principles can operate at different scales; the question is whether there is an idea that science investment will be directed at a regional scale and then within that region it could follow a Haldane Principle in terms of focusing on the excellent research and building up excellence within that regional scale, just as you could say within the European framework programme there are issues about how you select the excellent projects at that scale. We are talking about operating on different scales and whether there is a view that in order to support the economic development of all parts of the UK there should be a greater distribution of research funds. That does not mean to say that some research programmes should not be operated on a national level or purely on the basis of excellence—as indeed the research councils are in

Scotland for example—but at another level either central government or some regional body decides to make strategic investments that complement and work with the resources that are distributed purely on the basis of excellence.

Q173 Dr Iddon: Have we not got into a difficult situation which is creating tensions in allocations, whether you believe in Haldane or not, partly because the state departments are not funding the volume of the research that they used to do, Defra being a typical example. Why have we let that situation develop? You are nodding, Professor Edgerton, let us start with you and then Nick Dusic.
Professor Edgerton: The reason goes back to the point I was making earlier, that there is a certain disillusion with large scale departmental programmes like Concorde and the AGR; in fact, Tony Benn back in the Sixties said "No more Concordes" and Lady Thatcher certainly reiterated that in the 1980s, so there was a feeling that research, which was directly concerned with the well-being of people, the strength of the economy, was not yielding the results that it should. That contracted and, as you say, the research councils which had always funded a very small proportion of the total government research budget found themselves funding more. For that reason there was increased emphasis on trying to justify that kind of research in relation to the broader objectives, so you get a rather odd situation where people are expecting basic science in the universities to translate directly into economic benefits or social quality of life benefits for the British people in the short term. One has to think much more internationally and much more regionally as well about research and be much more focused on the necessary uncertainty that there is in research. As I said before, trying to create an industrial policy out of what should be a policy for university research is a serious mistake.
Mr Dusic: Going back to the original Haldane Report it is about the machinery of government and there is a distinction made between departmental R&D which is for a specific use and general research which would be outside of a department's objectives and so there is less political interference; now that is where we are. There are related issues about departmental R&D spending and the autonomy of the research councils to pursue research. The fact that departmental R&D spending has stagnated over the last ten years for the most part has meant that there are increased pressures upon the research councils to be delivering the sort of research needs that departments should be looking to fund as well as industry. The science policy needs to be seen as a whole and not just focused upon what the research councils should be delivering but the wider agenda in terms of government departmental spending and also encouraging industry to invest in R&D itself.

Q174 Dr Iddon: Professor Smith, whose job is it to reinvigorate the applied research that the state departments have largely been responsible for in past decades? Is it the Chief Scientific Adviser's job or whose?
Professor Smith: It is very much a concern of and on the radar of the Chief Scientific Adviser.

Q175 Dr Iddon: Does your evidence that you are receiving suggest that the Chief Scientific Adviser is going to try and persuade the departments to invest more of their money in the research base?
Professor Smith: This is a set of issues which are being discussed over the next few weeks and months in the new Science and Innovation Committee and the Chief Scientific Adviser is leading on discussions with that committee.

Q176 Dr Iddon: That is very good. Did somebody else indicate that they wanted to come in?
Mr Dusic: We have a science minister who is at the Cabinet table who chairs the Science and Innovation Committee; hopefully one of Lord Drayson's roles with his expanded remit is to get other ministers and other Cabinet members to see the importance of investing their budgets in R&D, so hopefully that will be the case.

Q177 Dr Iddon: I just want, finally, to turn to a statement that CaSE has made and that is "The lack of transparency in the science budget allocation process makes it difficult to determine if a decision was made by a research council or the Government" and what you are calling for, I understand, is more transparency in the policy-making process. I guess I should ask Professor Smith again: would a more open and transparent discussion between Government and the research councils and indeed the research community that they represent be a good thing, and is that on the radar screen at the moment?
Professor Smith: There are two aspects to it, one of which I have already mentioned, that I have set in train and identified a group of national bodies that I will formally consult with in the lead-up to the spending review, and their submissions will be published. In relation to the research councils, there is actually a process, of course, leading up to spending reviews where there is an iteration of plans, demands, pushbacks, discussions and negotiations at a technical level about money, and many of those things are necessarily confidential, commercial in confidence, because they involve things like international subscriptions or whether one continues to invest in particular institutes or whatever. But, as soon as that debate and negotiated part is over, the allocations are published in the booklet as you know, so there is total transparency at that stage. What I am trying to inject in the process is much more transparency about, let us say, the views of the Royal Society, the views of the Royal Academy of Engineering as we shape the big strategic picture that leads up to the allocation.

Q178 Dr Iddon: Do you think when a major player in our research business gets refused a grant that they ought to be able to enter into a dialogue with the people at the research council who have made the decision, as happens in America, to find out why the grant has been refused essentially?

Professor Smith: I will have to duck that in the sense that I do not exactly know what happens in America but if we have to have the resource and the research councils to enter into prolonged debate with everybody who did not get exactly what they wanted in their grant application we would be spending a significantly greater proportion of the research money on administration than we would on actual research.

Q179 Dr Iddon: The system works well in America and people can see why their grants have been refused.
Professor Smith: I will go and educate myself on what the Americans do.

Q180 Chairman: Just before we finish this and I pass you on to Graham Stringer, in terms of the grant letters to the research councils why do you think they are not made public?
Professor Smith: I know that a request has been put and is being considered at the moment by the secretary of state so we will wait and see what comes from the secretary of state.

Q181 Chairman: Do you have a view on any of these things?
Professor Smith: Part of the view is what I have just said. I have only been in the job for a period which meant that I did not take part in the nitty-gritty of the lead-up to the previous spending review. But I know that there is a period in the process of discussion, bids, iterations around bids, where a lot of the content you be regarded as commercial in confidence in the sense that it affects various kinds of interactions with all sorts of bodies.

Q182 Chairman: We understand that.
Professor Smith: In my view as soon as that process is over the equivalent of, for example, the letter that goes from HEFCE to the universities is the allocations booklet.

Q183 Chairman: That is the allocations booklet.
Professor Smith: Yes.
Chairman: Okay, thank you.

Q184 Graham Stringer: Professor Charles, the Regional Studies Association told us that there should be a regional science policy; what would it look like?
Professor Charles: The question of what a regional science policy would look like depends on what institutions the UK decided were needed in order to develop such a thing. At the moment we have got a fairly ad hoc system whereby the RDAs try to dabble around the edges in order to support investment in certain areas of science which they think are relevant to their particular needs. We have a very different situation in Scotland where there is actually a science strategy for Scotland and the Scottish Government has identified areas in which it wishes to invest, which would complement that investment which might come from a UK level. By and large there are not the institutions in the regions of England that are effectively placed to identify areas of strategic investment that might complement and strengthen that which is coming through the competitive process, either through the HEFCE QR system or from research councils. In many of these regions there is no departmental government investment in science so there is not a regional science policy, yet we see a number of countries around the world, both federal countries and non-federal countries, where there is significant investment in developing the research base for the regions and in many cases there are institutions which have developed either through devolution or through other means in order to foster that. We do not have that in this country.

Q185 Graham Stringer: That is very interesting and it is not the answer I was expecting at all. What you are saying is it is really a matter of government structure and institutional structure and not a matter of resource allocation on a spatial basis. Usually when people talk about regional policies it is because there is this huge imbalance in investment in science in the golden triangle of Oxford, Cambridge and London and a much sparser allocation of resources in the regions; are you not concerned about that?
Professor Charles: In order to address the issues of resource allocation you need to have mechanisms that can allocate those resources effectively, and my argument at the moment is that in order to have that effective allocation you have to look at the institutions that would decide what that should be. That could be central government—if you take the example of Finland, Finland has invested in centres of excellence and centres of expertise across the regions in Finland, they have a more decentralised approach, but it is done from central government in consultation with stakeholders within those regions. In other countries where there is a regional government that has its own policy, its own strategy and makes its own investment and seeks there to complement what might come from central government you have a different kind of mechanism, but unless you get the mechanisms right, unless you get institutions that can make sensible decisions you just get a kind of ad hoc system which may not lead through to effective resource allocation.

Q186 Graham Stringer: Is that an implied criticism of the regional development agencies?
Professor Charles: I do not think the regional development agencies have the history, the established expertise or the resources to be really effective at this. Typically an RDA will have maybe two or three people who have some knowledge of science and innovation, broadly speaking. That is not a successful base on which you can really look at a very significant support for science. What we are talking about in other countries where you have got a regional government or a state government, you have a department for industry, science and innovation where you have a team of people who are working in that area. Also, in a federal system, typically those regional or state-level bodies have their own departments with their own internal science investment, they have their own R&D

centres, they have their own scientific advisers who can help them make those sorts of decisions. Without that kind of base in the RDAs I cannot see how they can do the same kind of job that, say, an Australian state, an American state, Catalonia or a German land can do.

Q187 Graham Stringer: Professor Smith, why have we found it so difficult to establish why there is a scarcity of investment in science in the regions outside of the big universities? Is it because there is an application of the Haldane Principle as understood in the department that says we do not interfere, or is it because you do interfere but you do not like telling us about it?
Professor Smith: I have a picture in front of me which looks across regions at research funding normalised by population and, clearly, London and Cambridge act as quite big magnets but I do not think actually that there is this kind of famine level across the regions that you speak of. The distribution is not as extreme.

Q188 Graham Stringer: Can I just interrupt you. The genesis of this part of this inquiry came partly from our visit to Daresbury which was limiting funds, and we were told there that outside of the universities and national institutions over 90% of government funding was going into the golden triangle, which rather dissolves those figures—though obviously if you put Manchester and Newcastle Universities in you get different figures. That is part of the concern and the Committee has been told different things: one, that ministers will not interfere with regional policy because it is in conflict with the Haldane Principle, and at other times we have been told by ministers that they will protect investment at places like Daresbury. Can you explain it to us?
Professor Smith: The version of the Haldane Principle that I think you quoted John Denham as referring to earlier drew this separation between government having a role in really major strategic decisions—for example, if we are going to build the world-beating medical research centre in St Pancras that puts together a huge number of partners and massive levels of investment that only government can negotiate in the current situation. That is not the same—at the other end of the scale—as interfering at a micro-level with decisions. Looking in front of me, if you look at the rhetoric in and around the golden triangle there are an enormous number of large facilities located outside that golden triangle—in Edinburgh, in Manchester, in Durham, in Liverpool, in Nottingham. There is a slight exaggeration of the picture, and if you look at the research investment—as I say, I have a graph where there is a peak in London and some in the East of England but there are considerable resources going from the research councils across the regions.

Q189 Chairman: Could I interrupt you there, Professor Smith, to say would it be possible for the Committee to have this information because we do not have access to that?
Professor Smith: If it would be helpful.

Q190 Graham Stringer: Could you also give us that information in the way it was given to us at Daresbury, that disaggregates the research carried on in universities from that carried on in other centres?
Professor Smith: You might have to communicate to me more precisely what you were given and I will try and replicate it.

Q191 Chairman: Yes, we will. I am desperately trying to move on. Nick, very quickly.
Mr Dusic: What Graham Stringer said about Daresbury where there are different signals given from ministers about the guidance given to research councils regarding it, that is why we put in the request under the freedom of information to get the science budget allocation letters to the research councils so there is a bit more guidance about what ministers are telling research councils.

Q192 Chairman: But you are being told the allocation booklet gives you all that information.
Mr Dusic: I would be interested to see the letters to see if that is the case.

Q193 Chairman: You do not feel that that is sufficient.
Mr Dusic: The science budget allocation booklet gives us the high-level commitments for the different research councils.

Q194 Chairman: But not the rationale.
Mr Dusic: Not the rationale. I think the letters would provide some more information which would be useful.

Q195 Chairman: Can you understand why this Committee has been denied that information?
Mr Dusic: We have been denied it too; I do not understand it.

Q196 Dr Harris: Professor Smith, do you accept the distinction between the allocations booklet and the letter?
Professor Smith: I thought I had tried earlier to explain that the interchanges of letters that lead up to that involve matters which are toosensitive to be in the public domain.

Q197 Dr Harris: Do not repeat that, but some months later there is the final allocation letter a la HEFCE, do you accept that that is different from the allocations booklet as Mr Dusic has just said? If you do, why is it that months later that is not available like it is for HEFCE?
Professor Smith: I think I said it earlier: the allocations booklet would be the equivalent of the final letter that is sent out to HEFCE, which is the final picture once all the dust has settled in and around the discussions and negotiations.
Chairman: All right, we are not going to get anything more from you on that.

Q198 Mr Boswell: Professor Smith, just a final question and then perhaps something to the panel in the light of what you say. The Government's debate on strategic science policy is now under way; is this specifically and explicitly going to consider regional factors?
Professor Smith: That debate could well have a regional dimension. Take a specific example: if we up the ante on something which has already been launched through the ETI of offshore power generation of various kinds—marine technology for example—if we are going into that in a big way it inevitably has a geographic location element to it.

Q199 Mr Boswell: It is a derived consequence rather than a conscious allocation.
Professor Smith: It is a derived consequence. You do not start saying "can we put something around the coast?"

Q200 Mr Boswell: Can I then ask the other members of the panel whether they feel that there should be a specific regional tier in this debate up front as being a requirement for a rational science policy? Professor Edgerton.
Professor Edgerton: To have a national science policy in the singular is an impossibility. We have the possibility of having many different kinds of science policies but a regional science policy is also an impossibility and to attempt to get one is undesirable. We should get away from the whole Haldane-oriented way of thinking about this and insisting that it is only because you have a national research council that you can achieve high quality. By suggesting that we should break the monopolies of the research councils—not all of them have a monopoly, the Medical Research Council does not quite of course because of the Wellcome—and have a series of bodies, perhaps headquartered in different parts of the country that compete with each other to generate the best quality research, that take not just a national view but an international as well as a regional view; I think that will help us get away from the rather self-satisfied view the research councils sometimes take of their own endeavours and open that up to competition, to new thinking, to genuine debate. It would be very difficult for a research council in, let us say, Leicester to fund work in Manchester, but if they are held to account on the basis of the quality of the research they will do it.

Q201 Mr Boswell: Any views from Nick or Professor Charles on that?
Mr Dusic: The UK-wide research councils provide a really strong benefit for the country and that should remain. One of the things we are having to look at, because of devolution, is regional science funding coming through the different funding councils. It is therefore a different landscape that we are doing science policy in and that needs to be respected and understood. DIUS understands that but it needs to have a UK-wide focus and an England-only focus as well. Maybe the Council for Science and Technology which has a UK focus could be looking at the science policies across the UK, looking at how they develop and how they interact and challenge both the UK Government and devolved administrations to make sure they are up to scratch.

Q202 Chairman: The last word from you, Professor Charles.
Professor Charles: There is often a problem in this country in that we associate regional with not being the same as excellent; there is often an assumption that what happens in the regions is by definition of lower quality—it goes back to the RAE where we talk about sub-national quality, national quality and international quality. We need to move away from that, we need to be focused on excellence and international quality everywhere but recognise that in different regions there may be different areas of excellence, different areas of opportunity for exploitation of science and technology and, therefore, we might need to have a variety of different objectives and priorities.

Q203 Mr Boswell: My final question is could there be some difference in weighting within regions or between regions as to whether they were pure science or had a strong element of regional industrial nexus policy?
Professor Charles: It is inevitable that there might emerge a different focus. If you allowed the scientist base in the regions to identify their areas of research you would get a different pattern emerging no doubt, and if there was an institutional base in the region that could identify what the priorities might be they would possibly look different. Until we go down the route of this exercise and actually try to build a debate at a regional scale, to see how that might relate to a national science policy—and indeed to the policies that are emerging from the EU—we do not really know what that would look like.
Chairman: Thank you very much indeed. I am sorry we have overrun on your session but it has been really good. Thank you very much indeed Professor Adrian Smith, Nick Dusic, Professor David Edgerton and Professor David Charles.

Witnesses: **Sir Roland Jackson,** British Science Association, **Professor Ian Haines,** UK Deans of Science, and **Tracey Brown,** Sense about Science, gave evidence.

Chairman: We welcome our second panel for this afternoon on the inquiry into putting science and engineering at the heart of government policy; we welcome Tracey Brown, Director of Sense about Science, welcome to you Tracey, Sir Roland Jackson of the British Science Association, welcome to you, and Professor Ian Haines of the UK Deans of Science, a distinguished second panel. I am going to ask Evan Harris if he would like to open this session.

Q204 Dr Harris: Good afternoon. What mechanisms might the government put in place to ensure adequate and independent scrutiny of

scientific evidence and whether it is being used appropriately in policy formation? What sort of structures do you think do exist or ought to exist or ought to be beefed up? I do not mind who starts.
Ms Brown: We have seen a period of quite unprecedented innovation and focus on that concern. The Committee has noted the installation of chief scientists in departments, the rewriting in 2005 of the chief scientist guidelines and, from the point of view of evaluating the quality of the evidence that is used in policy-making as much as the content, it is something that Sense about Science has promoted, and we have been delighted to see things like peer review discussed much more widely in government. However, there is potentially a procedural limit on these sorts of questions and I detect quite a strong push towards wanting to have a set of questions or procedures that enable you to make good, evidence-based policy. In fact, there are two problems with this. We have got great guidelines—if you look at the chief scientific adviser's guidelines they are very good but one of the problems is that they do not stand up to political pressure and in fact what you get is policy-driven evidence in those circumstances. They have co-existed with quite a number of cases where we have had policy-driven evidence and I do not think they are strong enough to stand up to that. In fact, without the kind of scrutiny that parliamentary committees offer I cannot see how—the Government has got a long history of innovating ways around procedures—we will not end up always in that situation when the political pressure is on.

Q205 Dr Harris: You do not think there is anything internal that is strong enough.
Ms Brown: No.

Q206 Dr Harris: Could a Chief Scientific Adviser who was prepared to be firm actually prevent the Government, doing something or do you require that to be publicised in order for that to be effective?
Ms Brown: It would be an odd thing to hang an approach around the personality of an individual anyway but surely the position of those individuals could only be strengthened by having external scrutiny. There is always going to be this problem of having to engage with awkward evidence and people giving you awkward advice who may well be the chief scientist at times. The need to engage with them would become much stronger if you felt that you would be called to account for the decision-making process and for whether or not you listened to that advice, and indeed that the chief scientist would be called to account for whether or not that advice was being taken on board.

Q207 Chairman: Professor Haines, can we bring you in?
Professor Haines: I very much agree with what Tracey has said. There is a real difficulty in suggesting that one person, working within Government, can possibly have the power and knowledge to make these decisions. One of the points that we made in our evidence, which we did not know, was the proportion of civil servants—or perhaps more senior civil servants—who have science and technology backgrounds; if the Chief Scientific Adviser is going to have the extent of advice internally there would need to be some very serious overview of the extent to which there were scientists and technologists working within the department under that person.

Q208 Chairman: A constant theme for this Committee is to get the answer to your very question. Sir Roland?
Sir Roland Jackson: The point I would make, which we made in our evidence, which is very much related to this is that it is really important—it sounds obvious—for government to be clear when it is consulting and when it is communicating, to be clear about that. I can imagine from all sorts of points of view it is occasionally helpful to maybe be a little bit unclear about that, but certainly looking at it from a public perspective it really does risk increasing distrust in the political process if government is not specific about that.

Q209 Dr Harris: All of you have said that there is a need for the external scrutiny to be tough and you have mentioned parliamentary committees which we can come on to, but are there any other mechanisms that could be introduced to make sure that there is effective external scrutiny—for example, using the learned societies in a more formal way?
Professor Haines: It depends on where you are looking for scrutiny. One of the things that concerns me is the way that policy gets developed. The term "great and good" has already been used once today and there is this danger that the same people come and say the same things in whatever consultation exercise there is. There is a consultation for the future of higher education at the moment and a certain group of individuals have been asked to write reports and statements about their view of the future. I would actually like to see, just once, somebody being willing to take up the nettle and saying "We are going to invite, almost randomly, under 35 year old scientists to come to a meeting and discuss where science should be going in the future" and not keep on looking at the great and good who, no matter who they are, have got their own interests. In terms of professional bodies, the professional bodies will always tend to grind on—and I am a great supporter of the Royal Society of Chemistry—with their own particular interests. Deep down inside, the under-35s have got new ideas, radical ideas, which we really ought to be getting to tap into.

Q210 Dr Harris: Professor Haines has mentioned in his evidence the need for there to be a Science and Technology Committee as of old, recast in some way, in order to have that scrutiny of science across government. Does either of the other two agree with that?
Ms Brown: In some form. Actually, if you go back to the Science and Technology Committee's 2006 Report on the Government's use of evidence it wrote the mandate really for how that Committee should

evolve. It is not quite the same remit perhaps because there is a difference. One of the problems we are talking about when we are talking about science policy is are we talking about the science wow and how or are we talking about science as in UK Plc and the investment strategy and the research base or are we talking about scrutiny of decision-making? Although those things overlap quite a lot there are distinctions.

Q211 Dr Harris: You think that Mr Willis is not doing a good enough job on the last of those with this Committee?
Ms Brown: There is a loaded question. The scrutiny of decision-making is actually the most valuable role that a scrutiny committee could play. It opens up questions about how decisions were reached and the evidence on which they are based in the way that the public actually has a way of getting hold of, and indeed scientists more widely have a way of getting hold of. We experience a lot of people saying to us that they have got frustrations, as many scientists had with, for example, the Physical Agents Directive, for over a year, not knowing where to take them because there was not an open consultation that asked those kinds of questions at that moment in time. The existence of the Committee created that option, but I would be really cautious about the idea of a further panel of experts that scrutinises. One of the other sides to having a parliamentary committee is its democratic accountability and there is a lesser problem, one that fewer people raise, of the scientisation of politics and elevating the role of the expert above the role of the elected officer. Having parliamentary scrutiny is actually quite a healthy thing from that point of view as well.

Q212 Dr Harris: It is in the remit of this Committee to do what you have just described but are you saying—and certainly this has been said—that because the remit also covers innovation, universities and skills, therefore there is not enough time for this Committee to do what the old Science and Technology Committee did. Or do you think it should be just a higher-level priority for us to do it ? Or should there be a new committee to do it which means we would on this Committee not do it?
Ms Brown: As I understand it the sub-committee functions at the moment.

Q213 Dr Harris: There are fluid sub-committees. As I understand it it is in our remit so sometimes we could look at a decision across government or in a government department if we had the time, and we could do that in the sub-committee or not, so the sub-committee is not a material point. Obviously there are always priorities; the question is, is there merit in that work being done by the same committee that has responsibility for looking at the role and the work of the Science Minister and his/her department, or does that not matter and you could have a freestanding scrutiny committee looking at the evidence base behind decisions?
Ms Brown: The second option is probably the most important one and I am not necessarily best placed to know whether it would be possible to combine that entirely. As a cross-cutting role of the Committee I just cannot see how you could possibly not have a cross-cutting role of the main Committee if you have Chief scientists in every department. In fact, if you look at the sorts of examples that the Science and Technology Committee dealt with—for example in that 2006 Report—they were not all concerned with the department that the universities and skills base were in.

Q214 Dr Harris: Sir Roland?
Sir Roland Jackson: I do not think I have a great deal to add except to comment that this Committee has taken a lot of interest in this particular area. This inquiry has been running for quite some time now and indicates that you can address these issues over a length of time and in the way in which they evolve and, clearly, things have evolved quite substantially in the past year.

Q215 Chairman: Can I just interrupt? One of my concerns here about this particular exchange is that in order to be able to scrutinise something effectively you have to have a body of information presented to you which is capable of being interrogated. In terms of this inquiry, which is about science and engineering policy, we seem to have had a number of speeches made which indicate a change of policy, and actually getting to grips with that is incredibly difficult. Do you share that frustration?
Professor Haines: Absolutely. The three speeches and the difficulty of working out quite where the balances were were summed up very well at the earlier discussion. Can I come back to this business of should there be a separate committee for science? In our evidence we suggested there should be; it is not the suggestion that the Chairman is not doing his job, nor is it the suggestion that the members are not doing their job, it is just that we feel that the Committee is too broad. From innovation—and that is economic innovation—on the one hand, right the way through to skills of all kinds of an undescribed nature, it is too big. I just happened to look at a few of the evidence sessions that you had in January. I looked at three: there were no more than six members able to be present and at two of them there was not even a contributor from each of the three main parties. That I do not think is sufficient support for the business of questioning what the Government is doing and what the departments are doing outside DIUS.

Q216 Dr Harris: I want to change to a specific area which is to work out if there is any role for internal scrutiny to protect scientists giving advice. I want to take the Home Office as an example because it has been in the news with regard to its misuse of statistics, which it has admitted, and where there does not appear to have been any civil service intervention before that was done—the internal statisticians did not seem to be involved—and then there is the whole business of the Advisory Council

on the Misuse of Drugs. There are two issues there and I want to focus on the second of these: First is the fact that the Government rejected the advice of its advisers while still trying to claim that it was evidence-based policy and, secondly, is the treatment of the adviser himself, Professor Nutt, where he was castigated publicly for publishing in a scientific journal some of his work. Was there a role for the Home Office chief scientist? Who should have come to his defence within the department because, as far as we know, no one did?

Ms Brown: At the time that it happened I suspect that the Home Office chief scientist was not aware of late night phone calls. There is a serious issue in terms of the knock-on effect of this as well. It is something on which you have to absolutely 100% back the independence of the people you have asked to come in and give independent advice. We have over 3,000 scientists working with us on a whole range of projects and we are already picking up a really negative reaction to that. There was already frustration about the number of people who feel that their time is misused sometimes and it relates to something that Roland raised actually, which is not just the need for consultations and the use of expertise to be clear about whether it is communicating or consulting, but also what the status is that that is being given. Are you submitting something that is going to be the basis of a policy or are you just throwing your lot in the pot? That is often not clear to scientists and academics who give their time for free. That has a serous implication and unless you want to see all the work that has been done since the Phillips Report on improving the contribution made to policy-making, then that is something you are going to have to take really serious issue with.

Q217 Dr Harris: Does either of the two of you have a view on his treatment or are you not aware of the case?

Sir Roland Jackson: I am aware of the case and I would echo the way that Tracey saw it.

Q218 Chairman: Do you think there are scientists that you know of, even the great and the good, who might be more reluctant to provide expert advice to government in case the government disagrees with them and they get a hard time?

Sir Roland Jackson: I do not personally have any evidence to that effect and I certainly know that a lot of scientists who give evidence would still be perfectly prepared to go ahead and do so, but it does not help the climate.

Q219 Chairman: Can I move on? Tracey, you told us that debate on science and policy engagement tends to only make "euphemistic reference" to the existence of misconceptions. What do you mean by that?

Ms Brown: What I mean is that where there is a problem in the way that an issue is portrayed in public it would be quite useful if consultations actually spelled that problem out.

Q220 Chairman: Would you give us a concrete example?

Ms Brown: For example—although actually I am picking on something which is perhaps not the worst example—the recent consultation that started two years ago on the Human Fertilisation and Embryology Act update made reference to things being controversial, for instance, and did not explain why they are controversial or actually on what basis the Government assumed them to be controversial. In fact, we looked at the evidence being used there to ascertain public opinion and discovered it was a circular set of references where the Chief Medical Officer had called it controversial so the Department of Health did so, and in fact there was not a study that showed that the hybrid and chimera embryos being discussed there were particularly controversial. It would be very helpful for people to lay things out in a way that actually refers to how they would have experienced the discussion in society around them.

Q221 Chairman: Sir Roland, you mentioned that your Association wanted to have a science and society framework in which we could actually have positive engagement—in other words that you would set the rules and terms for a science and society engagement to take place. What has happened to that proposal, where is it?

Sir Roland Jackson: I would not dream to attempt to set the rules.

Q222 Chairman: The framework then in which you could actually have a sensible debate.

Sir Roland Jackson: There has recently been a consultation by DIUS on their science and society strategy, introduced by the previous Science Minister, Ian Pearson, and we are awaiting at the moment the formal response to that. My Association's suggestion was a parallel to what the Government had done to bring coherence to the whole area of science education through the so-called STEM programme; we were simply saying we think there is a need and an opportunity to take that slightly wider picture, look across the whole science and society interface which, as others have commented, is very diverse. There is a multiplicity of purposes and reasons for people to do this and, essentially, to help clarify the landscape a bit to say what are we doing and why in which areas, and do we have the sort of infrastructure and capabilities and culture in those areas that are necessary to take things forward.

Q223 Chairman: Do you think that is possible?

Sir Roland Jackson: I certainly think it is because actually a lot of the elements of it are in place already, and it does not need a heavy touch by government either because there are many independent agencies involved in this business for their own perfectly legitimate reasons, but enabling those to work together for better mutual effect is where government should be putting its efforts. It should be supporting those things where people are starting to come together and the most recent big example is

the Big Bang Fair that I know you were involved with—which was initiated by us with Young Engineers and then by the ETB—which has brought together 50 or more associations in a common purpose for a much bigger national impact over time. There are a number of areas where we can continue to do that by either exploiting existing networks like National Science Engineering Week or the Sciencewise Expert Resource Centre and others or, if there are gaps, identify where those are and seek to fill them.

Q224 Graham Stringer: In terms of public understanding and participation in scientific consultation the media often gets an unjustified bashing; what do you think the learned societies or the scientific community as a whole could do to help the media get their stories more accurate or better? It is easy to blame the newspapers but could the scientific community do more? Tracey.
Ms Brown: An awful lot is already being done there. If you look back five or six years ago many universities and professional learned societies did not really have a media-facing function for their science communication; now they do, and you have the Science Media Centre and a lot of organisations that have learned to work with the media. Actually, for all that people say that the media are a problem, we are blessed with a lot of people in the UK who take their time to pursue stories pretty well and make the relationships fairly effective. I also think the media raise quite a lot of important questions about the basis on which decisions are made—we can refer back to our earlier discussions—and that is often overlooked.
Sir Roland Jackson: I would agree with that. On the whole we are remarkably well served by our media, particularly supportive agencies like the Science Media Centre, and we take great care to cultivate relationships with journalists at times like the Festival to get a huge and almost invariably very positive coverage of science and engineering and what is going on. There are some systemic things which can be built on which are that it really is very important for the scientific and engineering community to understand how the media works and to work with the grain of the media because the media are not going to change in principle. Schemes like our media fellowship scheme or other training schemes that other organisations run that enable scientists to work directly with journalists and understand how the two can work better together are really important.

Q225 Graham Stringer: This is slightly Utopian, is it not? There is obviously a lot of good reporting but there is the MMR media reporting, stem cell research, GM foods, all of which have been appallingly reported. That is slightly the best of all possible worlds, that sort of outlook, and it ignores the real problem, if you do not mind me saying so.
Sir Roland Jackson: It depends how you define appalling there. From the MMR point of view one could say the scientific community should have come out earlier, rather than the journalists necessarily, and highlighted where the balance of evidence actually lay. In terms of GM it is a very, very complex debate because like most of these things it is not just about science, it is about other clashes of values and perceptions and, in cases like that, again, the scientific community should come out all guns blazing and explain, while recognising where other people are coming from, what its perceptions and views are. Journalists on the whole respond to that.
Professor Haines: We should not be complacent about this but it is a fact that the majority of the population do actually believe that scientists and science are good for them and are moving the world forward. I say we must not be complacent, but I would say that there will be that section of media outlets that are always looking for the bad story, the story that sells the newspaper or the story that gets people to turn on the television at 8.30 and watch their channel rather than somebody else's. We have to keep on fighting and struggling against that but, broadly speaking, science has been on the up for a considerable amount of time in the opinion of the population as a whole.

Q226 Graham Stringer: What are the best examples of public engagement exercises about science that have led to a real improvement of the public's understanding of a particular scientific issue and why were those examples successful?
Ms Brown: They are not necessarily at a national level. One of the things that our Trust does is respond to questions from anybody who has got any kind of audience or constituency which could be a local midwife trying to deal with a story about plasticizers in babies' bottles or a local authority addressing concerns about wi-fi in schools. Actually where things become successful I think are where people have relationships that they can pursue their questions through, which is to say "Is this even a scientific question?" That is the question we get asked the most, "Is this even a scientific question?" and then if it is "Where do I go?" because there may be X number of engineering institutes but who knows which are for what and whether they will answer my questions. When people form those relationships and get confident to pursue those kinds of questions, those tend to be more the successful things. I do not think that there is some kind of policy for harmony on a national level that we can establish that would prevent any kind of blow-up of a vaccine scare or that kind of thing. At that point we just have to look at who the players in that discussion are and whether people are putting forward the arguments and the evidence and work it out as they come up.

Q227 Graham Stringer: It is very interesting in terms of process and individual examples. Sir Roland and Professor Haines, are there examples you can give us of something on a national level that has led to a better understanding of science?
Sir Roland Jackson: I am not sure that we have ever really deliberately orchestrated those sorts of activities. This is again something that we put in our evidence, that we suggested that selected

government consultations on major areas of policy in relation to science could be used by government if it so wished with an educational agenda alongside as well. To give you an example, I recall all the consultations around the Energy White Paper a few years ago which, like most public consultations, were primarily stakeholder consultations—the usual suspects and institutions responded. The material that was produced for that was really very detailed and actually written in a very accessible way, and could quite easily have been turned into something that could have been used by a whole range of organisations like science centres or us or others to broker a set of individual debates and discussions around the country, to inform people about what the issues were and, crucially, to pick out what was coming back in public debate and feed that back in. I do not think we are doing enough of that and that would both help the policy process, give a lot more validity to the policy process and educate the public at the same time.

Professor Haines: You asked the question in a rather specific way about the understanding of science. I know that there are different words used at different times but I am not sure I would want to use the word understanding of science in relation to people recognising what science had done for them; I would prefer to look at it as appreciation of science and in that people are fully aware that it is scientists that are going to solve the problem of HIV AIDs, climate change—we will leave out the issue of whether it is global warming or not—and a whole range of other issues. I do think that people do appreciate that science and scientists are going to solve all the kinds of problems that they have an interest in.

Q228 Dr Harris: Do you think they make a distinction between proper science and TV nutritionists?

Professor Haines: No, and I do not think that a certain heir to the throne helps very much in that regard either.

Q229 Chairman: I am going to meet another member of the Royal Family in half an hour; we will leave that subject there.

Ms Brown: Can I just make a point about peer review though because when we set out some years ago now to popularise an understanding of peer review scientists laughed about it because they experience it as that really awful, dull thing that frustrates them. Actually we published a short guide called *I Don't Know What to Believe* and we found that 200,000 people wanted it, which we had never anticipated, and we now find that the question "Is it peer reviewed?"—which is not to say it is right or it is wrong, it is good or it is bad, it just says have we at least got to the stage here where something is being published so that it can be scrutinised by others and we can have a conversation then about what others said—is starting to crop up. We monitor the use of that and that leaflet is now used by NHS Direct, it is part of the 21st century science teaching in schools and just the recognition question that the calibre of the science you are looking at is as important as the findings and the possible conclusions. That is something where there has been a lot of success and it is not only ours, we have encouraged lots of others to do likewise, and people are beginning, even at a very basic level, to ask the question "What I am reading here on page 3 of the *Daily Moon* is that actually good science or bad science?" That is actually quite a new question for people to ask and a very helpful one.

Q230 Dr Harris: Does it help them to understand the importance of publishing the evidence to help judge if it is reliable?

Ms Brown: In a mixed fashion. There are some people who are very aware of the need to do that and there are obviously still cases where that does not happen, which refers back to the point I was making earlier that it is political pressure actually that forces people to explain the basis on which they reach a decision.

Q231 Graham Stringer: My final question, Tracey, you outlined the initiatives that affect democratic engagement by the public rather than audience participation. Can you expand on what the key differences are in those two approaches?

Ms Brown: Similar to the difference of the enjoyment of science in popular science—reading popular science books, going to see shows and that kind of thing—and actually pursuing something where there is an element of accountability, where you are even asking the question why is the Government telling me this is right, or this is evidence-based and how has it come to that conclusion. That is the beginning of the path of democratic accountability, it is a different process. I would also add that I am slightly wary of the idea that seems to be around in relation to DIUS about it having a strategy. I know Roland has referred to the need to engender trust and, clearly, we do not want people doing things that encourage mistrust, but it is actually healthy for people not to have a blanket trust. That we should celebrate things like sharing science, your love of science, or improving science education or dealing with difficult issues—those things are maybe justified in their own terms rather than because they help improve trust in government or in DIUS. It slightly worries me that there could be a manipulative element to those kinds of activities, that the reason why DIUS might fund a science fair might be because they are hoping to promote some sort of trust me, do not look too close at everything else, we have done the science fair.

Q232 Dr Iddon: I want to turn now to consultation and how the government goes about it. How do you think the Government could improve its consultation? Ian, can we start with you?

Professor Haines: I mentioned the consultation about the future of higher education earlier. That does tend to appear to be something where in choosing a certain group of people to in the main produce their own personal report, having admittedly in most cases—as far as I can tell from the reports, all of which I have read—gone and consulted with a certain number of people; I think

that is not in any way the way to progress; it is much more important to have some open meetings with some open questions. I went to the meeting a couple of weeks ago on the government agenda for science which John Denham spoke at and it was actually very interesting because by the time John Denham had given his speech there was a serious opportunity for people to question the minister. With about 250 people in the room virtually nobody put their hand up. I would suggest that that was an indication of people sitting there tending to feel that the decisions had already been made, so what I am arguing for is much more open discussion; open questions rather than closed presentations.

Q233 Dr Iddon: Not just the usual suspects; okay. Roland?

Sir Roland Jackson: This came up in evidence that others gave to you a couple of weeks ago. It depends very much on what the purpose of the consultation is because there are, quite legitimately, different framings and emphases for a particular consultation. Is it a consultation about the policy per se, is it about how we implement the policy or whatever, so clarity about that is really important. The dimension I would add, which we put in our evidence, which again is trying to give a broader public voice to government consultation, is to say that alongside the traditional stakeholder type of route which we have all talked about it would not be that difficult to instigate some sort of more continuous, what you might call social intelligence gathering around what are likely to be key areas of science policy. I am thinking, for example, of what we did in nanotechnology a few years ago where we worked with partnership organisations to run a whole series of events on discussions around nanotechnology, to collate the views from those discussions, feed them back into subsequent discussions and then pull out what people were saying. A lot of that will give you similar views to the views that come out of more in-depth social science work or sometimes out of questionnaire work, but if you had a system that in a sense enabled you to tap in on a continuous basis to areas of public interest and concern about science I think you would then be able to provide policymakers on a timely basis with much more nuanced and up to date evidence. I think that would be helpful.

Q234 Dr Iddon: Tracey.

Ms Brown: One of the biggest problems is not knowing what is at stake. It is like the classic thing, if you went round an estate of people and asked whether they were fed up with dog mess they would all say they absolutely hate it, but if you say shall we get rid of all the dogs in the area as a result of that decision they would not say the same thing. That is half the time the problem, people do not know whether they are expressing a preference or whether they are being asked to actually make a decision, in which case they need to take into account a much broader range of potential consequences. One of the things that has happened for Sense about Science is that when we have raised concerns about new developments of policy, not just with departments but also with statutory bodies under them as well, they have complained that there was a consultation period, why did we not hear about it then. But sometimes what is at stake only becomes clear at some later stage of implementation, and then the scientists get told off for the fact that they did not realise quickly enough that this was going to wipe out their use of a particular procedure, for example. We had this with the Tissue Bill, we had it with the Physical Agents Directive and so forth. That is actually quite a problem in terms of explaining what it is at stake—it is not just the social reaction to that, it is also trying to work these things through. At the moment I have had a conversation with the Statutory Instruments Committee and they are wondering with all the things that are coming through from Europe actually what is likely to create some sort of a reaction, how are scientists getting to hear about new European directives that may then have an impact on the kind of work that they can do. We only hear about it at the point at which it is being implemented into UK law, by which point it is really a bit too late to be trying to do something about it, it is a big uphill struggle. There is a problem there with not knowing what the implications of things are until a later stage.

Q235 Dr Iddon: Are you all aware there is a Cabinet Office document on how consultation should be conducted?

Sir Roland Jackson: Yes.

Professor Haines: Yes.

Ms Brown: Yes, and it has actually begun to have a slight improvement on the thing about not just going to the usual suspects. I have really noticed that departments are going much more broadly with who they are consulting.

Q236 Dr Iddon: How do we measure the success or otherwise of a consultation once the government has done it, is it possible? Tracey.

Ms Brown: That is defined by the terms of what it was for in the first place. I think if it has not uncovered a significant reaction or problem then of course you could say it is unsuccessful but if the consultation is to appease public opinion about something that is a bit of a more tricky issue. If it was to be seen to be doing the right thing or to give people the feeling that they had had their say—some kind of almost psychological benefit for the participants—then that is actually a much more difficult thing to look at and I am not even sure that that is what consultation should be for.

Sir Roland Jackson: I would point here to the Sciencewise Expert Resource Centre and some of the work that it is doing, which I hope will tease out some of these things, because what it is trying to do is support a culture right the way across government, particularly in relation to science and technology issues, of what sorts of consultations might be carried out for what purposes and how, and how you evaluate that. I would look out for their work as it carries on and is published.

Professor Haines: I do not know that I can add very much but I am just thinking that when one goes to a conference one fills in a form at the end that says what you thought of the conference. I just wonder once whether there might be an opportunity to say what one thought of the consultation.

Q237 Dr Iddon: The Government carried out a consultation on science and society and it reached two amazing conclusions: first, that there is a need to increase high quality public engagement and, second, that we need to increase the UK's stem base. As the first conclusion was essentially the reason for conducting the consultation in the first place and the second conclusion is already government policy, what was the point of that exercise? Did you take an interest in that; I am sure you did.
Ms Brown: It is such an enormous range of subjects that were covered that it did just re-pose the questions in the end and I think they found themselves with something perhaps rather overwhelming because it was not very focused. One of my frustrations is that there is very little being invited in the way of true evaluation of what had gone before, which I suspect might be because there is a lot of incentive to talk about the fact that money was well-spent, and therefore nobody wants to ask the really difficult questions about where it might not have been so well-spent. Surely, actually, that is where you are going to develop quite a useful set of insights into what should be developed in the future. It is only a summary that has been produced and they are now looking to evaluate that summary, but the hands-off almost no comment feel to it is quite strong.

Q238 Dr Iddon: Are there any other comments about that particular consultation?
Sir Roland Jackson: I would say that what the consultation, as far as I have seen it so far, has shown—perhaps not surprisingly—is how diverse and complex what we call public engagement is. Some people see that as a problem, and it certainly is if you try and see it as one activity, as a lump, but what you need to do and what I hope will come out in the consultation at the next stage is to focus down and say yes, we agree it is a very broad area, it covers all the way through from the things we were talking about here such as scrutiny of the way decisions are taken that have some public relevance, right the way through to exciting young people to take a career in science. What we need to do is to say okay, these are the legitimate purposes, the main purposes for which this public engagement is being carried out, do we have the right infrastructure and systems in place for each of these particular reasons, each of which is valid but they are distinct and different and trying to capture it all under one heading is a bit too difficult.

Q239 Dr Iddon: Too ambitious, okay. Professor Haines.
Professor Haines: I do not think I have got anything to add.
Dr Iddon: Thank you very much.
Chairman: On that degree of unanimity we will bring this session to a close. Thank you very much indeed Tracey Brown, Sir Roland Jackson and Professor Ian Haines.

Wednesday 1 April 2009

Members present:

Mr Phil Willis, in the Chair

Mr Tim Boswell	Dr Brian Iddon
Dr Ian Gibson	Ian Stewart
Dr Evan Harris	Graham Stringer

Witnesses: **Professor Chris Gaskell,** Chair, Defra Science Advisory Council, **Dame Deirdre Hutton,** Chair, Food Standards Agency, and **Professor Sir Michael Rawlins,** Former Chairman of the Advisory Council on the Misuse of Drugs, gave evidence.

Chairman: Good morning. Could I welcome our three extremely distinguished witnesses to the inquiry this morning, Putting Science and Engineering at the Heart of Government, looking particularly at how the Government receives independent scientific advice to deal with its policy. We have before us Dame Deirdre Hutton, the Chairman of the Food Standards Agency—welcome to you Dame Deirdre, an old friend of the previous committee but I think the first time you have been before the new DIUSS Committee—Professor Chris Gaskell, the Chief of the Science Advisory Council for Defra—welcome to you again—and, by no means last, Sir Michael Rawlins, the former Chair of the Advisory Council on the Misuse of Drugs and current Chairman of the National Institute for Health and Clinical Excellence, but we are discussing principally your role as the former Chair of the Advisory Council on the Misuse of Drugs, to put that on the record, and I will rule out any other questions to you other than in that particular area. We have a number of people who wish to declare interests.

Mr Boswell: Chairman, I think, for completeness, I should declare my interest as a former minister at MAFF, as the precursor of Defra, and, indeed, before that as a special advisor to MAFF and, indeed, I am still a member of the old comrades association of that joint body.

Q241 Chairman: We will move on. The interest for the committee this morning is that we have three witnesses who come from different advisory organisations to the Government. We are trying to get a feel. I wonder if we could ask each of you, starting with you, Dame Deirdre, to give us a couple of minutes as to how you would describe your remit and who do you report to, very briefly.

Dame Deirdre Hutton: Thank you very much indeed, Chairman, and also thank you to the committee for inviting me. The remit of the Food Standards Agency is very broad. The legislation states it as the duty to protect public health from risks which may arise in connection with the consumption of food and otherwise protect the interests of consumers in relation to food. So it is a very, very broad remit that covers more or less anything that is in food that either is produced or eaten. We are an independent government department—we do not have a minister; instead we have a board and a chair who are appointed by Nolan rules -we operate in a completely open and transparent way and we are accountable to Parliament through, but not to, ministers at the Department of Health.

Q242 Chairman: In terms of reporting to Parliament, how does that happen other than your written reports? We clearly have your latest one before us.

Dame Deirdre Hutton: Largely, in formal terms, the written report is how that accountability is expressed to Parliament, although, clearly, appearing before select committees is also a very important part of that accountability, but in the broadest sense, I would say, from the fact that everything we do, every piece of research, every decision we make, is put into the public domain, that is another very important way of expressing that accountability.

Q243 Chairman: How often do you appear before select committees? Is it usually the Health Committee?

Dame Deirdre Hutton: Certainly the Health Committee, House of Lords committees as well—Science and Technology Committees, sometimes Defra—I appeared in front of the Efra Committee recently—not, however, a very great deal, but we are, of course, at your disposal when you wish to call us.

Q244 Chairman: Thank you very much indeed. Professor Gaskell.

Professor Gaskell: Thank you, and thank you, too, for the invitation to come. This is the first time, I think, Defra's SAC has been in front a select committee and I am glad of the opportunity. The Council was created in 2004 and its function is to advise and challenge Defra, through the Chief Scientific Adviser, on the quality and appropriateness of the science base and the science evidence that Defra is using. We are independent; I do not think I would say fiercely independent. We are constructed and appointed under Nolan rules; we are all independent of Defra; we publish all our proceedings; all our recommendations and advice to the CSA (Chief Scientific Adviser) are put on the web. We hold one public meeting a year and we are there to be called to account whenever and by whomever is appropriate.

Q245 Chairman: Do you think you are an effective organisation?

Professor Gaskell: I think we are. It is an evolving system. The whole system of CSAs and SACs within government is evolving, and you will have had, or have access to, the advice from OST, for example, on codes of practice to the Science Advisory Council, and we contributed quite significantly, I think, to that because we had, in Defra, as much experience as anybody of this type of independent advice and challenge. We seek to look at our effectiveness in two ways. We actually have audited, and are due to so do again, but we did a couple of years ago audit the response of Defra to all our recommendations and look and see whether they were accepted, accepted in principle, which is sometimes a euphemism, or rejected.

Q246 Chairman: We know the feeling.
Professor Gaskell: You know the feeling. The vast majority were accepted, and we follow that up; we follow up how that has been put into place. So that is one way in which we judge our effectiveness; I think that is the major way in which we judge our effectiveness.
Professor Sir Michael Rawlins: I am here as the former Chairman of the ACMD, but I have been a member of the government Scientific Advisory Committee since 1979, so I bring quite a bit of experience, and I have the scars as a consequence. The ACMD, which I chaired for ten years, is set up under the Misuse of Drugs Act to advise the Home Secretary, and other government departments, on a broad range of matters related to substance misuse. It is a large council. Its members are now appointed under Nolan arrangements. In the old days they just emerged, but now it is done under Nolan arrangements, and over the last few years it has become much more open and transparent. Under my chairmanship, we started meeting in public, which we had not done before, and I think meeting in public is very important. The FSA took the lead in this when John Krebs was Chairman, right from the very beginning, and I learnt a lot from him about his experience and I introduced the same measures in both NICE and the ACMD.

Q247 Chairman: You report directly to the Home Secretary, do you?
Professor Sir Michael Rawlinsl: Yes.

Q248 Dr Gibson: I will ask Professor Gaskell and Professor Rawlins: how often do you appear on Radio 4?
Professor Gaskell: This week?

Q249 Dr Gibson: This week. Quite often?
Professor Gaskell: Sometimes, but not always as Chairman of the Defra SAC.

Q250 Dr Gibson: But you have been its Chairman.
Professor Gaskell: I have commented as Chairman.

Q251 Dr Gibson: And I know you have, Professor Rawlins.
Professor Sir Michael Rawlins: Yes, Boxing Day was my last appearance on Radio 4 on *The Today Programme*.

Q252 Dr Gibson: I ask that question because the follow up question is: when you go on Radio 4 do you make contact at all with any government department, civil servants? Does a minister phone you up and say, "Be careful or else"?
Professor Sir Michael Rawlins: I have never had a minister phone me up before going on *The Today Programme*.

Q253 Dr Gibson: After?
Professor Sir Michael Rawlins: No, I cannot recall one after. Sometimes, of course, the whole thing is set up by the communications or press office of the Home Office or the Minister.

Q254 Dr Gibson: But are you aware when you go on Radio 4 that you might be being listened to by Downing Street and others—
Professor Sir Michael Rawlins: Oh, yes.

Q255 Dr Gibson: —and if you get it wrong, you will get hammered?
Professor Sir Michael Rawlins: Of course.

Q256 Dr Gibson: You might even lose your job.
Professor Sir Michael Rawlins: Of course, yes.

Q257 Dr Gibson: You are not really independent in than sense, are you?
Professor Sir Michael Rawlins: Well, anything we do we could get it wrong and get hammered. There is no question about that. The members and the Chairman can say the wrong thing and say such a dreadfully wrong thing in public that the Government and the electorate and people might lose confidence in you.

Q258 Dr Gibson: I only ask because the word "independent" slips out quite easily. Dame Deirdre did say in the definition that the board and chair were separate and independent. What I am trying to prove is that you are not exactly 100% independent, you are part and parcel of a government machine?
Professor Sir Michael Rawlins: I think the important bit to me for the independence is not the fact that the secretariat is provided by the Government, government money and all that sort of thing, it is really about being free to provide government with the views that you believe are the right ones based on the evidence before you.

Q259 Dr Gibson: Have you had any view suppressed by government, or anybody else, who said, "You must not say that. It is a danger to the nation"? Have MI5 ever been on to you, or MI6?
Professor Sir Michael Rawlins: Not that I am aware of.
Dr Gibson: Is there a click when you pick your phone up?

Dr Harris: You have never been flown to Morocco!

Q260 Mr Boswell: You did say carefully that you have never been rung by ministers, but are you given a line to take from time to time by senior officials when they are aware that you are going on the *Today* programme, or whatever?
Professor Sir Michael Rawlins: I cannot remember actually. I cannot recall such a thing happening.

Q261 Mr Boswell: Certainly you would not be seeking advice?
Professor Sir Michael Rawlins: No.

Q262 Mr Boswell: You go with your own brief.
Professor Sir Michael Rawlins: Yes.

Q263 Mr Boswell: You would not be seeking to concert your advice with the official line before you went on it?
Professor Sir Michael Rawlins: No, I am much more anxious to give the line of the committee that I am chairing.

Q264 Chairman: Professor Gaskell.
Professor Gaskell: I think, while not in the same league of Radio 4 appearances as Sir Michael—
Dr Gibson: Your time will come!
Dr Harris: It is a new performance measure!

Q265 Chairman: After this appearance before the committee they will be after you all the time.
Professor Gaskell: Thank you very much. I will look forward to it. I did want to, I think, emphasise that we do genuinely feel independent. I think this an interesting point. You will find there is a difference from some other science advisory councils. We report to the Chief Science Adviser; we do not report to the Minister. Our advice to Defra is very clearly through him.

Q266 Dr Gibson: Through Bob Watson.
Professor Gaskell: Through Bob Watson and Howard Dalton before him. Indeed, it was Howard Dalton who was the prime mover in establishing the Council in the first place, because he recognised that with the broad brief that the department has, for any one person to assume they had the scientific advice at their fingertips would have been inappropriate, and so he very specifically, and we have been very robust in this, decided that he needed independent advice and challenge, and if you talk to Bob Watson, as you may do, he places great emphasis on our capacity to challenge and to say things that may well be inconvenient. Science is occasionally inconvenient and it does not always provide the answers, and that is true in Defra.

Q267 Dr Harris: A couple of quick questions. Your SAC is different from the committee that exists at the Home Office, I think, where they have the chairs of all their advisory committees in a committee which I think they call their Scientific Advisers Committee, but that is different from your beast.

Professor Gaskell: It is different from our beast. Our beast is a committee of experts, it is not an expert committee, which I think is an interesting distinction. In other words, we are not put together to answer one specific set of questions around one specific area.

Q268 Dr Harris: So is their Home Office committee.
Professor Gaskell: Yes, but though we do much of our work through sub-groups which members may well chair, we do not come together as a group of chairs to form one overseeing committee, which you are saying is the model elsewhere, and I think Dame Deirdre may wish to comment on that in the context of the FSA as well. We come together as a group and are appointed under Nolan rules with the objective of providing broad experience.

Q269 Dr Harris: This Nolan appointment: you are still appointed, you are still nominated by a minister, are you not?
Professor Gaskell: No. We have just been through a process of renewing the committee as some members come to the end of their tenure, and it was put out to open advertisement and, with a member of the selection committee from the Office of the Independent Adjudicator, myself and Bob Watson, we then interviewed people who applied through open advertisement.

Q270 Dr Gibson: So it takes three people to apply.
Professor Gaskell: No.

Q271 Dr Harris: Dame Deirdre, were you appointed in that way?
Dame Deirdre Hutton: I was. I replied to an advertisement, I filled in a form, I was interviewed twice and then the recommendation went to ministers, who agreed it.

Q272 Dr Harris: If someone like you is not renewed, is that Lord Nolan saying he does not think you have done a good job, or is it you not expressing an interest, or do the ministers say, "We want to re-advertise"?
Dame Deirdre Hutton: I have quite a strong view that it is a good idea for regulators, which I consider myself, only to do one turn because then it enhances your independence. If you are asking about my personal decision not to stand again, it was that I have been there four years and done most of the things I set out to do.
Chairman: I would really like to get back to Dr Gibson.

Q273 Dr Gibson: It used to be said by John Krebs that they did not have enough scientists in the FSA to begin with. That suggests that the original recruitment process did not identify the areas in a targeted way that were necessary to function at a 100% level. They just took who came along and who was interested and applied in the early days of the FSA. I know it has changed. Is that true? They have gone through a process?

Dame Deirdre Hutton: We have certainly gone through a process, and I am assuming you are talking about the board here.

Q274 Dr Gibson: Yes.
Dame Deirdre Hutton: As Chairman I would look at the skill-set that we have on the board and decide what else we need. Out of 13 members at the moment we have five board members with a range of scientific backgrounds, so I think it is pretty well catered for, and within the staff itself, just under 50% of our staff are scientists and 67% of them have higher postgraduate qualifications.
Dr Gibson: What about lay people? How valuable are they? How necessary are they? Does it give credibility to your committee to have them? Do they function? Are they any good? Do they shut up all the time? Tell us your experiences.

Q275 Chairman: Can we have an answer from all of you, please, as well?
Dame Deirdre Hutton: We have lay people throughout the organisation and on the board, but if I start with the board, we absolutely have lay people. I regard them as extraordinarily important, because what we do in the agency is that the risk assessment is provided by the scientists and we have a very robust scientific governance methodology for making sure that that is good independent science, but the role of the board is to do risk management, which is about blending that science together with the concerns of the public and various other issues like the economics. So the role of lay people is extraordinarily important in highlighting actually what the real issues are for the public in terms of their acceptance of risk. We have lay people on each of the scientific advisory committees and the importance there is that they will help frame the questions that the scientists look at right at the beginning of the process. We try to blend those societal interests with science the whole way through the agency's operation.

Q276 Dr Gibson: Do they cut the scientists down to size, in your opinion?
Dame Deirdre Hutton: I do not think they cut the scientists down to size at all; I just I think they help them do a better job.

Q277 Chairman: Do they get paid, Dame Deirdre?
Dame Deirdre Hutton: Yes.

Q278 Chairman: Do lay members and the other members of the committee?
Dame Deirdre Hutton: I was about to say, yes, firmly, and I realise I am not quite sure. I think they are paid a daily allowance. Can I just have a minute? They get their expenses and an allowance, but are they paid a salary? No.

Q279 Chairman: Professor Gaskell, the same question.
Professor Gaskell: I will just pick up on that issue. All members are paid a daily rate, exactly the same, irrespective of the expertise they bring. We would regard lay members as bringing in expertise. The problem with the term "lay" is that it can be used pejoratively and it is not a pejorative term; it suggests another skill-set which is of value to the committee or council on which they sit. You might be interested to look at the evidence (and it is on the website under the Science Advisory Council) that we provided to the consideration of the review of the Code of Practice for SACS. We put together a number of paragraphs around our perspective of the role of lay membership. We feel they do have a role to play; they do bring a different perspective. I think the degree of importance that they have will, of course, vary with the type of committee. In our committee, as I said, which is a committee of experts, in many senses many of the people there are lay for 80–90% of the time because it is the main issue of the day which somebody else has got the FRS in and they have not: so another perspective, but one could argue that that is, nonetheless, a scientifically trained perspective. What lay members often bring is a capacity to ask the awkward and inconvenient question and to bring another perspective. We have a number of social scientists on our Science Advisory Council and, of course, they will bring a different perspective from the natural scientist. So I think the term "lay" is encompassed by a range of inputs across the council, and we are very clear that we are expecting council members to contribute to the business of the Council even when it is not their specialty area and in that sense act as a lay member.
Professor Sir Michael Rawlins: The Advisory Council on the Misuse of Drugs has a very broad membership, about 35 people, ranging on the one hand from judges, very senior police officers to pharmacologists, psychiatrists, psycho-pharmacologists, to social workers, people with experience of delivering services to substance misusers in the voluntary sector. So it is a very broad group. It also has a technical committee, which is chaired by the Professor of Pharmacology from Oxford, Les Iversen, and that does a lot of the detailed work for the council but it is the council that makes the decisions and gives the advice at the end of the day.

Q280 Dr Gibson: I have some experience of lots of committees and the ability to keep dissidents off them seems to be number two on the first agenda, because they can slow things down, they have absolutely ultra views in terms of the establishment's view about scientists. If we think about the Human Embryology Authority, there were people on there who you would describe as dissidents in terms of the forward movement of human embryology research, and so on, but they always resisted putting them on there, and that created in the public a kind of suspicion of the organisation. Would you put a dissident on your committee, or allow them to go forward, or encourage them so that you had that view up there in lights, in front of the public, and you would argue it out open openly, or would you, like happens in a lot of arenas, try and keep them off? Do you agree that that happens?

Professor Sir Michael Rawlins: I think there is a temptation for it to happen because it is easier to chair, but on the other hand, you have the broad views of a range of interests, and the ACMD is a classic example of police officers on the one hand, very senior police officers, judges and people in voluntary organisations at the other extreme, and it is very important for all those views to be heard. What the ACMD has never done, and I think, on balance, it is right, it has never had substance misusers as members of the committee as service users, if you like. It has been suggested, but it has never done that, and I think that is probably right.

Q281 Dr Gibson: Chris?
Professor Gaskell: I think it is important to be open as a Council, as I said earlier, to inconvenient views. We actually have debated this on the Council. The trouble is one personalises this if one is not careful, but we do have members on the committee who make a point of being contrary in order to demonstrate the debate, and we have also had the debate about how we represent uncomfortable views across the spectrum of science to the Chief Scientific Adviser in the advice we give him, because it is inappropriate and improper to provide a modified and sanitised view of the scientific evidence. If there are strongly held but sometimes minority opposing views, they need to be taken into account as well as part of the advice you offer up. I like to think that we are robust and that we do not shy away from inconvenient truths or inconvenient views.

Q282 Mr Boswell: It is a bit like a Civil Service submission, is it, to a minister. It does say, this could be (a)—
Professor Gaskell: But you should know . . . ..

Q283 Mr Boswell: —but you should know (b) and (c).
Professor Gaskell: Yes.

Q284 Chairman: You do not have any dissidents on the Food Standards Agency?
Dame Deirdre Hutton: We cover a broader range than embryology, for example, so it would be difficult to pinpoint the particular dissident that would be appropriate on the board, but I do, quite deliberately, as Chair, set out to make sure that I have people who are difficult, because actually it makes for a better debate and it challenges you and stops complacency. However, in any subject that we are dealing with which is current, you will almost certainly have working groups, or steering groups, or whatever it is, set up. We will always make a point of including "the opposition" on that, because it is much better on the whole to have that debate in-house and hear it and deal with it rather than to have people shouting over the barricades.

Q285 Mr Boswell: Can we go to the question about how you determine the topics you are looking at as independent advisory committees and who sets the terms of reference for them? Perhaps I will ask that question first. If you start with a clean piece of paper, how do you fill it? What topics do you select, who marks your card as to what you should go on, and so forth? I will perhaps start with Michael, if I may.
Professor Sir Michael Rawlins: The issues come to the ACMD from mainly two sources. Ministers specifically ask specific questions, and that is quite right and proper, but also issues are raised through members, and they come from various sources. For example, the police may raise issues with us that are concerning them from their intelligence, and so on and so forth, and then we may use that as the starting point of a topic. It comes from a number of different sources but, broadly speaking, either from ministers or from the council members themselves.
Professor Gaskell: Defra SAC is interesting in that it is an evolving Council with an evolving agenda, which I think is quite proper. When we were first established we were there, I think, to support as well as challenge, and perhaps the emphasis then was to support Howard Dalton as a relatively new breed of CSA coming in from outside, coming in from academia four days a week, carving out a niche with his own agenda. So, for example, we helped him look at issues like quality assurance of the science, how science moved through into policy—there were a number of issues there that we took on on his behalf—but the formal answer to the question is that the agenda is set for the Council by a mixture of advice asked of us by the CSA (Chief Scientific Advisor). Bovine tuberculosis would be an example where we have offered him advice.

Q286 Mr Boswell: Just to be clear, because you were talking about your reporting into the CSA, you will not, as it were, get a ministerial fiat that says, "You will look at this", you will get a CSA request that you should.
Professor Gaskell: We serve the CSA, and that is, I think, a point worth re-emphasising because it is not the model across the whole of government; but we will also set our own agenda and sometimes it will be a mixture of debate. For example, we have just done a significant piece of work on the use of social research, social science, within Defra. We were concerned, and we voiced these concerns, that Defra, in part, was seriously lacking in the evidence base around social science. Indeed, in some areas it was not even an intelligent customer, it did not even know what questions to ask, let alone how to use the evidence. So we forced that through and we have made a number of recommendations which, I think, have been very helpful to Defra. Recently an agenda that we are now picking up on is Defra's handling of data and its use of modelling. That is something that has emerged from the committee. We feel that we want to look at that and we have told the CSA that we are going to do it, and we will do it. Equally, I mentioned bovine TB, but in the past he has requested evidence from us around epidemic diseases in animals, around contingency planning, for example, and that has been a sort of symbiotic relationship of challenge and advice at the same time.

Q287 Chairman: In terms, for instance, of the development of Pirbright and the need to have Level Four facilities for large animals, was that something that you have looked at?
Professor Gaskell: We have looked at the way in which Defra has responded to the foot and mouth outbreaks, and we have challenged them in that context, and as part of our commentary on the management of the last outbreak, we talked tangentially about the need for there to be the strongest science base to inform the policy and the contingency plans. We have not been directly drawn into the debate between Defra and DIUS over the funding and the management of Pirbright and other science facilities around epidemic diseases.

Q288 Chairman: Is that not rather sad? Is that not something you should be doing?
Professor Gaskell: I have talked to the CSA off-line, as it were, about it, and I think there is a level of frustration, as there is quite widely, around the situation we find ourselves in, and I think it is not unlikely that the Science Advisory Council will be asking some questions of the CSA at its next meeting.

Q289 Chairman: Dame Deirdre.
Dame Deirdre Hutton: We are just in the process of drawing up our next strategic plan for 2010 to 2015, and one of the activities we have been engaged in, in terms of food safety, is HACCP [1] for the whole food chain), that is a hazard analysis starting, effectively, with the pig and going to the sausage and working out where the difficulties are. If I give you one example, we have increasing levels of food-borne illness from campylobacter. If you look back up the food chain, you can start to see where that campylobacter emerges: it is a problem in poultry. So using that type of tool, we are trying to be very rigorous about, hence, where we put our resources going forward. So that is one approach. We have instituted a new scientific committee, which we call the General Advisory Committee on Science, which is chaired by Professor Colin Blakemore, and one of the functions of that committee is to do horizon scanning for us, both in the UK, but also in the science community around the world, to give us an indication of what might be important and what we should look at. Our chief scientist does an annual research report on research. It is difficult to pin down one way in which you decide what to do, but there is quite a robust process for gathering in information and disseminating it. We currently have out for consultation our strategic plan for that 2010/2015 period, and I would be delighted to provide you with a copy of it if you would find that helpful.

Q290 Mr Boswell: I think it would be. Thank you. Probably in the interests of time, trying compress this a bit, can I try some shorthand on you and see your response? It seems to me from those three responses you are, in effect, moving from a responsive mode collectively, where you are reacting to ministerial or CSA requests, to one where you are striking out a little more on your own. Is that something you see as being proper and something you are resourced for? To put it another way, slightly following Ian's line of thought, rather than dealing with a dissident, if a minister was not happy with how it was going, would he make sure you had not got the resources to do the inquiry that you wanted to do? How do you feel about that?
Dame Deirdre Hutton: The first important point to make is we are funded directly from the Treasury, not through the Department of Health, which is a significant point. I would say that the Food Standards Agency has always been fairly proactive about the way in which it has chosen to do science. All that has happened, in a sense, is that we are getting better at the way we scope that out and the sources of information. It would be fair to say that the agency, as well as food safety, started working on nutrition some years ago, and that is a subject which has become of increasing interest to government. So, certainly in terms of our nutritional work going forward, we do co-operate with the Department of Health, because it would be very stupid if we were using public resources to do the same thing, but that is process of collaboration and making sure that our agendas are working alongside each other rather than being told what to do.
Professor Gaskell: I think you are right in the sense that, as I said, we were evolving and that we see our challenge role as very important, as, indeed, I have to say, does Bob Watson. He is constantly challenging us to challenge him, which is a good relationship to have. I do not think we would ever see ourselves moving away from the mode of advice as well. If CSA wants advice, then he should be able to ask for it and we should be able to provide it or provide a mechanism for providing him with independent advice, independent of the advice that he may be getting from within the department. So he can do a sort of, "Can you let me know that what I am hearing inside the department is kosher, that it does stand up to external scrutiny?" That, I think, is a very important facet for him. The issue about resources is interesting. We are resourced from within the department. There have been occasions where resource has been tight, but then the department has been under the financial cosh anyway. That is not a continuing problem. I also think that it is proper for us to emphasise, and I think Defra accepts that there is enlightened self-interest in this for them, that they have enlightened self-interest in there being a perception that their science is good. That may be in part because of a historical reputational baggage that they had, but certainly I think Defra gains considerable pleasure from the fact that on occasions its SAC is held up in government, and it has been by the OST in reports on science within Defra, as a model for useful work.

Q291 Mr Boswell: Sir Michael.
Professor Sir Michael Rawlins: During the ten years I was Chairman of the ACMD there was never an occasion where we were precluded from doing something because of lack of resources.

[1] *Footnote by witness*: Hazard Analysis and Critical Control Point: food safety management system

Q292 Mr Boswell: That is very helpful. Thank you. I am just trying to wrap this bit up. I will ask two questions. One is evaluation of your impact. Do you have mechanisms for doing that? The second one—perhaps it is related—is the question of open meetings. Do they add value to your consideration and, perhaps going on from that, have you thought or, indeed, have you embarked on e-consultation about something ahead of considering or invited people's submissions as to what you should be considering?

Dame Deirdre Hutton: In terms of evaluation, it happens to us in quite a number of ways. The agency is currently part of the Go Science Review and we are expecting that report fairly soon. We are also evaluated by the Better Regulation Executive in terms of our approach to regulation. We have also just had a report produced from Consumer Focus, called *Rating Regulators*. So there is quite a lot of evaluation that goes on to us. We are also very keen on self-evaluation and we do an awful lot of it. After every major food incident, for example, we have an evaluation of how we did that. Do you want me to go on to the second question?

Q293 Mr Boswell: If you can, quickly, yes.

Dame Deirdre Hutton: On open meetings, we are, I think, becoming increasingly transparent. For example, our board meetings are web-streamed and we find now that people are moving more to watching on the web than coming in person. We do constantly try to think of different and better ways in which we can do that. A further committee which we have established is an advisory committee on consumer engagement, which is composed of experts in that world, which is there particularly to tell us smarter and better ways of talking to consumers, for example electronically, we have set up citizens' juries, et cetera. So we are always looking for new ways of communicating.

Professor Gaskell: In terms of impact, as I mentioned before, we have reviewed the percentage in crude terms of our recommendations that have been accepted, and we are comfortable with that. There are some that have not, and you might want to explore how we do or do not deal with that. There are other things where I think we have got a more subjective, though partly objective, interpretation of, impact. For example, we looked at risk, we looked at Defra's assessment of risk within its business and our report was well received and led to the establishment of a Centre of Risk Excellence and Development with EPSRC. We were glad of that in two contexts: that was a centre for risk, as we had suggested, but also it was working between research councils and Defra, which is always to be applauded. We have it on our agenda later this year to more formally audit our effectiveness by getting in external agents to assess and then report back to us on our effectiveness. Social science: there is an increased number of social scientists in Defra; I think we have made an impact there. So I think we are making an impact, and that is something you can test through others as well. Open meetings: one of our four meetings each year is an open meeting. We have had considerable discussion about this. It is an open meeting in the context that the public are allowed to come and observe the meeting. There are also question and answer sessions at the end of the morning and at the end of the afternoon, but they do not partake of the business itself. They have worked well in terms of feedback. We have had very good feedback. We have had well over 100 people and every time we have had an open meeting we have had more people than the last time; so we are impressed by the uptake of that and the feedback. Our last open meeting, if I am very critical, I do not think went as well as it should. We have reviewed that and we will work out why, but we do hold those open meetings and we think they are valuable. We have not had any e-discussions. It does raise the question (and we have discussed this too) as to what is our role in Defra's promulgation of its science? We do not see ourselves as part of Defra's science PR machine; we see ourselves just advising and challenging. People can come and watch us do that to get confidence in what we are doing, we publish everything that we do on the Web, but we are not there as part of the science PR machine for Defra.

Q294 Mr Boswell: Before Sir Michael's response, perhaps I should say, I had the chance to come and sit in as a silent observer of a NICE meeting with a number of colleagues and found that very valuable and quite reassuring actually.

Professor Sir Michael Rawlins: The Home Office has undertaken evaluations of the ACMD. That will be the sort of tri-tarts(?). Of course, the much more important thing is what has happened over the last, nearly 40 years since the ACMD was established. On one view you could say it has been a disaster because, by and large drug, drug consumption has risen very substantially over the past 40 years—of course, it might have been worse if it had not been there—but some things have changed and it is tempting to think it happened as a result of what the ACMD did. The consumption of cannabis fell 30% after we made it Class C. You might think that is a perverse consequence, but actually there is quite a lot of evidence of social sciences that actually reducing the classification stakes made it much less attractive for young people. It is no longer cool to smoke cannabis because now it is only a Class C drug. It is perverse and it emphasises the dangers of thinking that the classification system sends out a message. Anyway, that is a bit of the by-the-by.

Q295 Chairman: I think we might come back to that.

Professor Sir Michael Rawlins: Open meetings have gone very well, and I think the Scientific Advisory Committee meetings ought to be held in the default position, they ought to be open, and there should be very special reasons why they should be closed. The ACMD has part-closed meetings, because ministers have asked that the decisions should be made in closed meetings so that they are provided to ministers before they get into the public domain. That is an argument you can have with ministers, but that was their request. The open meetings also have one other advantage in that it does allow you to use,

as it were, the presence of the media to get messages across. For example, when we were discussing the use of anabolic steroids at the ACMD, I used that occasion very clearly so that the media could pick up the fact that anabolic steroids make the testes atrophy, produce male enlargement of the breasts. It is not all about getting a six-pack from anabolic steroids. I think one can use it that way too and so it has another advantage.

Q296 Dr Harris: Just a quickie to Professor Gaskell. You say you report to the departmental Chief Scientific Adviser. Let us say, for some reason, I am sure it would not happen in your case, you were traduced, attacked in the media unfairly and they called you a nutter, or something, because of your declared view on something, would you expect the departmental Chief Scientific Adviser to issue something, assuming he agreed, saying that he disagreed with the criticism and you were a good chap and he had confidence in you, or would you be not surprised if no-one said anything from the people who you reported to?
Professor Gaskell: I think, if that criticism arose as a result of a specific event, in other words an interview one had done or something one had written, it would depend on whether you had written that or said that in your role as Chair of Defra Science Advisory Council or whether, for example, as principal of the Royal Agricultural College, who are the people who pay my daily rate.

Q297 Dr Harris: If you were attacked by the press, wherever it had come from, in your role as a Defra independent adviser.
Professor Gaskell: I would not go bleating to the department saying, "I need your support here." I think in my role I may well be saying something that the CSA finds uncomfortable.

Q298 Dr Harris: I understand, but if you are attacked by the media unfairly, do you think science speaks volumes if no-one from the department to whom you report comes to your aid and says, "Actually we still have full confidence in Professor Gaskell even though *The Daily Mail* has had a go"?
Professor Gaskell: Oh, *The Daily Mail*. Yes; okay.

Q299 Dr Harris: When I said media, I did not mean *Nature*, I meant *The Daily Mail*, a non-peer reviewed paper?
Professor Gaskell: Yes, I think if the views that I was expressing were those that were being found useful and were being used and were in accord with the CSA's thinking, I think I would expect support, yes. I would not go desperately gasping for it, but, yes, I think one would expect, if it fitted in with the—

Q300 Dr Harris: If he did not like the advice you were giving, you would expect him not to support you?
Professor Gaskell: What I would expect him to say would be that the reason I have a Scientific Advisory Council is to offer me advice and be challenging, and I may not always find that advice palatable and convenient.
Dr Harris: Thank you.

Q301 Dr Iddon: Just occasionally you are going to give some advice to government which is uncomfortable to the Government and it will create tension between your committees and the Government. I wonder if each of you could give us an example of that. I think Sir Michael has already given us one example, which is very well-known, that of cannabis classification. Sir Michael, could you give us another example which is perhaps not so well know where your advice has been uncomfortable?
Professor Sir Michael Rawlins: During the period I was Chairman of the ACMD that was the only occasion when the Government actually rejected advice, as far as I recall. Since, of course it has been in relationship to ecstasy. Of course governments have perfectly the right to reject the advice of a scientific advisory committee, but I think when they do so they should explain why.

Q302 Dr Iddon: We are coming to that in a minute. I am just looking for the examples at the moment. Professor Gaskell.
Professor Gaskell: I think there is a difference between uncomfortable and unacceptable. For example, we gave them uncomfortable advice, I think, around their use of social science, but they took it on the chin and said, "Yes, you are right. We agree. We have got to do something about this", and we are following up how they are responding, but they accepted the uncomfortable advice. There have been some examples, I would have to say relatively minor, where they have not accepted what we have said, and they have been things that have been both scientific and also around the process. For example, we recommended that in order to protect the scientific reputation of the department, press releases should undergo some science scrutiny before they go out, and that was rejected on a workload basis. It has since been accepted because subsequent experience suggests that that probably was actually quite a good idea. We have also, for example, challenged them on the availability of data from the last foot and mouth outbreak, and the response that we have had we regard as unsatisfactory and we are pressing that. We say that we do not see the scientific validity, notwithstanding the fact that it is in EU regulations, for the three and ten kilometre exclusion zones around outbreaks of exotic diseases. That is uncomfortable. They are hearing what we say about that, but we will continue to press it. So we have a formal mechanism of requiring the CSA to respond to our recommendations within six months, and then we will follow up at a year to see whether the good words, or not, of six months have come into place. There are other examples I could give you.

Q303 Dr Gibson: Migratory birds: they get blamed for everything!

Dame Deirdre Hutton: I preface it by saying that we give advice to ministers in public, so it is known what our advice is. It is absolutely the prerogative of ministers not to accept that advice if they want to. I suppose in the early days of the agency—I give you two examples—there were some differences of opinion around GM foods and organically produced crops. More recently, we gave advice to the department on the fortification of bread flour with folic acid to prevent neurological defects, and the Chief Medical Officer took the view that he wanted to wait for further research. Those are a few examples.

Q304 Dr Iddon: I go back to Sir Michael now. When you have given this kind of advice which causes some excitement, do you get a chance to enter into dialogue with the Government and to ask them why they have rejected your advice? Is it a two-way process after the initial decision?
Professor Sir Michael Rawlins: No, not really. On that occasion not really, no. It was quite clear after a few days, well it was quite clear actually before we produced the report that the Government was going to reject the advice. The Prime Minister had said what he was going to do because he said it was the right thing to do.
Chairman: What is the point in having you then?

Q305 Dr Iddon: I was just going to ask. How did the members of your committee feel about that? They are giving their time without--
Professor Sir Michael Rawlins: Without any remuneration.
Dr Iddon: I felt the last time your advice was rejected that you might resign as Chairman.

Q306 Dr Gibson: You are not a quitter, are you, Michael?
Professor Sir Michael Rawlins: No, and I do not think resigning is the thing to do unless it is a really major point. On that occasion I think the Government should have explained much more clearly the basis. There was a suggestion that it was doing it because it would send out a signal, although we had made abundantly clear in the report that the classification system is not designed to be a signal, it is not legally supposed to be a signal, it has a totally different purpose and that it was the right thing to do, and I am afraid it was not the right thing to do.
Professor Gaskell: To back up the point made by Dame Deirdre, I think we accept on the Science Advisory Council that we are offering evidence that forms part of the total evidence base that goes towards policy and that on occasions there will be other issues that ministers have to take into account when making a decision on policy. Indeed, the policy-makers themselves may have a series of inputs in the advice they give to ministers. So while of course we would not wish to underplay the importance of core scientific evidence, I think scientists should not become so precious that they regard themselves as the only authorities in what is essentially a political policy decision at the end of the day.

Q307 Chairman: Would you agree with Sir Michael, because I think Sir Michael's comment was that if, in fact, the scientific evidence is being rejected in favour of some other decision, and we accept as a committee that ministers have every right to do that, they should make it clear what are the grounds on which it is being rejected?
Professor Gaskell: I think that is right, and as part of our process we require an explanation of why advice has not been accepted. No, I think it is a key issue. As I said, I do not think scientists should be over precious in thinking that theirs is the only evidence. The other point I would make about science evidence (and this is something we have discussed): where it is particularly irritating is where policy, or the explanation of policy, is supported by the cherry-picking of science advice; in other words, only taking that science advice which supports your particular policy decision. I think if a policy decision runs against the science, it should be explained in the context of all the science evidence, not just the bit that may be convenient.
Dr Gibson: This seems to be the kind of thing you settle before you take a job: "Sometimes, Prime Minister, I will find something out which does not fit in with your view about the science in the developing world as against the same science in Britain." That is a genuine debate. "I would expect you to tell me that. Do you agree?" Do you not negotiate that, or are you too frightened to ask for that, when you start your job? I would not take a job, certainly not, unless you could define these issues. It is not rocket science to see that coming up as an issue. That happens to everybody in a job. You have just got to clarify at it at the very beginning so that your relationship its open with the people that you have to work with. Is that fair?
Dame Deirdre Hutton: I think the great protection for the agency lies in its transparency. Clearly, if we have put in the public domain that we believe a particular course of action is right and the Government wishes to do something different, generally speaking the Government will explain why, and I think that is entirely sensible of them to do so, not least because our reasoning is also in the public domain. I do not find it a problem if government decides to do something else, I would say they have a right to do so. I would be troubled, I suppose, if I felt they were doing it on an entirely erroneous basis, and I guess that there could be circumstances under which, probably not I, but my board would wish to discuss the nature of that.

Q308 Dr Harris: Briefly, to show my independence, may I just finish the question I was asking you. You said something interesting, Dame Deirdre, that in order better be independent you believe in one term. I was a bit confused. Does that mean that if you go for a second term you need government approval for that second term? Otherwise, how would it make difference? I do not disagree with you; I am just seeking to understand what the relevance of a second term is to independence.

Dame Deirdre Hutton: Can I just emphasise that that is a personal view, but I think that if any regulator or any other public appointee goes for a second term, yes, that second term, in my experience, has to be approved.

Q309 Dr Harris: By the Government?
Dame Deirdre Hutton: Yes; you do not automatically do a second term.

Q310 Dr Harris: While we have got you on the subject, one thing I noticed from your annual report was, although you are funded by the Treasury, you are funded by the Government, they cut the FSA's funding in real terms when the rest of health was not cut, in fact it was in increased.
Dame Deirdre Hutton: Yes.

Q311 Dr Harris: Did you ask why that was, whether it was a sign of disapproval, or was it just a random act?
Dame Deirdre Hutton: We had quite a lot of negotiation with the Treasury and, to be honest, we are a very small government department and not key in the Treasury's thinking about public spending, certainly in the terms we are thinking about it now. We certainly had negotiations with the Treasury, but I think also the position we took, and the position I felt quite strongly, was that the Food Standards Agency has been incredibly well funded from the beginning. We had reserves which we could usefully use and, since this was public money, it also would become us to run our organisation very efficiently and we felt we could absorb that.

Q312 Dr Harris: So it is not a question of your independence being undermined by the threat of a real-terms funding cut?
Dame Deirdre Hutton: No.

Q313 Dr Harris: Coming back to the line of questioning that Brian Iddon was asking, Sir Michael, when you were Chairman of the ACMD one of your senior medical academic members wrote an article for a journal that was published some months later when you were no longer Chair but he was, and he was attacked by the media, was not defended, as far as I know, by the Chief Scientific Adviser, the Home Office Scientific Advisory Committee made up of chairs, he was attacked also by the Minister in quite strong terms for the views he expressed in that paper. Do you think that might have an impact, if that happened, on the willingness of people (a) to serve on committees and (b) to give views, even as an academic, that might be criticised in strong terms by ministers?
Professor Sir Michael Rawlins: In some ways I do not think one can really compartmentalise one's life into academic and being a member of an advisory committee; I think it is all one great blur. On the particular issue, I never saw the article before it was published, but I would say this. Risk comparisons are widely made for all sorts of purposes. The ACMD does risk comparisons in shoe-horning substances into A, B and C. The public is often given risk comparisons: the numbers of people dying from tobacco consumption are equivalent to a jet airliner crashing once a week—this sort of thing—and the sort of thing that Professor Nutt was saying in that article is just one example of a widely-used technique of revealed preference, which is widely used in the social sciences to look at the public's approach to benefit and risk more generally, and all sorts of examples are used. I have not brought it with me, but there is a well-known book called *Acceptable Risk*, published in 1981, which tabulates the numbers of days of life lost over the years, including days of lives lost from cigarette smoking but also illegal substance misuse, so the principle is well established.

Q314 Dr Harris: I am going to explain this carefully because I do not want a generalisable answer. In this case, this man who published this article in a peer review journal, which you thought was a reasonable thing to publish, was phoned up in the middle of his out-patient clinic and told to apologise publicly and the fact that she asked him to do this, the Home Secretary, was then publicised, and MPs laid into him, and no-one came to his support from the department as far as I know. Given that that happened, do you think that someone who is an independent adviser might decide they are not going to run the risk of being an independent adviser if that is going to happen or them, or people will not volunteer if they feel they are either going to be constrained for self-preservation or they are going to be publicly traduced?
Professor Sir Michael Rawlins: Yes, I think it depends on the circumstances. If David Nutt had written an article saying he thought that heroin and morphine should be legalised, then his position as Chairman of the ACMD would probably be impossible, whatever his personal views might have been. On this particular occasion I do not think it was appropriate for him to be criticised. What he did and the sort of comparisons he made were widely used in social sciences and everywhere right across the board. It was not an inappropriate thing to do and he was not trivialising—

Q315 Dr Harris: Tracey Brown, who spoke to us about science in an oral session earlier, said that she had heard that a number of scientists were now dubious about providing independent advice because they felt that if the Government disagreed with it they might have the same treatment. Is that a fair concern?
Professor Sir Michael Rawlins: I think, if that was to happen, it would ill serve the country.

Q316 Dr Harris: Do you think there is a problem with advice being trimmed, any of you, because people are worried that if they do not give advice either that the Government agrees with or that the Government likes the style it is done in, they are going to hold back, and how consistent is that with the Philips' Report approach about the importance of ensuring that scientists are totally independent and do not have the pressure or the worry about

having these things happen to them. We all have to live with *The Daily Mail*, but a phone call from the Home Secretary and then abuse in Parliament.

Dame Deirdre Hutton: I think our scientific advisory committees are reasonably insulated from government pressure because they report to the agency and to the agency's board, so I have no discomfort about worrying about whether they are feeling themselves deeply under pressure, and, as to the board, I would expect all my board members to be sufficiently robust to withstand pressure of the sort you describe.

Professor Gaskell: It has not been an issue for us, and I would agree I would expect and hope, and from the present membership know, there is degree of robustness there, but we have not been challenged in that way. If we were and it did put people off, I think that would be a shame. We have just recruited, and had a large number of applications for, places on the Science Advisory Council. Whether there was a cohort of people who did not apply because they were nervous, I do not know, but that is not the impression we have got.

Sir Michael Rawlins: I think the members are sufficiently independent that they just would not stand for anything like that. I never tried to put it on them and I would not want to.

Dr Harris: He apologised for his academic article.

Q317 Dr Gibson: There is another view that we have not touched on, this independence thing has taken over the conversation, but is it not naïve or arrogant of scientists to think they are independent of the political process? Perhaps they are not dependent on that pressure from Prime Ministers and being told what to do, but when they come into this job and take on the advisory role they are interacting in a social environment and they must know there is going to be political pressure at some level. Even within the same committee people have divergent views, and you have admitted that yourself, so they cannot be naïve about this. It is silly to think of being independent outside this big world because you are part of it and when you take the job on you have to realise you have to swim with the current or swim against it.

Professor Gaskell: As with all the decisions we make there is undoubtedly an element of pragmatism and, therefore, while challenge is proper, unreasonable challenge is improper. Most of our committee, and the others can speak for their own, is drawn from academia. One can scoff at it, but the element of academic freedom and the culture in which academics exist does give them a premise of independence and they are using that in their advice to Government leavened with pragmatism.

Dr Gibson: Until they are looking for a grant from a business!

Chairman: We will not move into that. We will leave that hovering in the air.

Q318 Graham Stringer: There is an alphabet soup of quangos and non-departmental public bodies and non-ministerial departments giving scientific advice to Government. Are there too many bodies giving advice to Government, not enough or is it a Goldilocks situation, it is just about right?

Professor Gaskell: In the context of Defra that is an interesting question and one we have just asked. At our next meeting we will be reviewing the alphabet soup of advisory bodies that are available to Defra and we will be looking at that. Against that, certainly for the Department with its history in MAFF, it was and is important for Defra to be seen to be using external advice and external advisory bodies and not, as it was sometimes criticised for, thinking it had all the answers and all the expertise needed within the Department.

Dame Deirdre Hutton: I sense no appetite in government departments for taking back the role of food safety. On the whole, I think they are very happy that it is done at arm's length. There are other smaller NDPBs, or whatever they are, that can be incorporated, and post the Hampton Review there was a degree of incorporation. For example, we took over the Wine Standards Board, which seemed entirely sensible.

Sir Michael Rawlins: I have never scoped the landscape, but I would hate to see a situation where we merged food and drugs like the Americans have into one massive bureaucracy.

Chairman: On that note, can we thank Dame Deirdre Hutton, Professor Chris Gaskell and Sir Michael Rawlins. Thank you very much indeed for your evidence this morning.

Monday 18 May 2009

Members present:

Mr Tim Boswell
Dr Ian Gibson
Dr Evan Harris
Graham Stringer

In the absence of the Chairman, Dr Ian Gibson was called to the Chair

Witnesses: **Rt Hon Lord Drayson,** a Member of the House of Lords, Minister of State for Science and Innovation, Department for Innovation, Universities and Skills, and **Professor John Beddington,** Government Chief Scientific Adviser, gave evidence.

Q319 Dr Gibson: John Beddington and Paul Drayson, thank you very, very much for coming. I have been given the chair of this session, but there have been arguments about the chair in Parliament, as you have heard this afternoon, going on. It will not be like that, I assure you. This is too serious a matter to reduce ourselves to silliness. You know this is the last session on Science and Engineering at the Heart of Government Policy, so we are really looking forward to some advice from you, so I will start off and lob you a quick one, and I think, Paul Drayson, you might want to answer this one. Do you think that science and engineering are at the heart of government policy, or are we kidding ourselves, or are they in the liver, I guess?
Lord Drayson: I think that we have made real progress over the last year in putting science and engineering more at the heart of government policy, and I think we can point to specific achievements which have helped to deliver that, but I do think that there is more that we need to do, and I think the focus on this area that your Committee's work has brought is helpful.

Q320 Dr Gibson: John, do you have a view?
Professor Beddington: Yes, I think to an extent—well, I have been in the job 14 months, a little bit longer than Paul, but by and large I am reasonably pleased. There is a lot more to do, and particularly I think on engineering there is an issue there where we really need to work harder.

Q321 Dr Gibson: Let us be a little more specific perhaps. We have talked to you before about civil servants with scientific backgrounds, engineering backgrounds and so on. What are you guys doing to meet the goal, and what is the goal?
Professor Beddington: I think one of the things that I was showing you when I was here last time was setting up this community of government science and engineering. I think the day before, we had held the first conference, which Paul and myself and Gus O'Donnell spoke at. We basically reformulated the plans for that, and we are happy to show them to you in detail if you would like, but I will just cover them briefly. The plan is that we want to double the number of people who we are actually electing to be part of the government science and engineering community.

Q322 Dr Gibson: Could you quantitate that, John?
Professor Beddington: Yes, we want to get it up to 3,000, it is currently at 1,600, by the end of the year. In addition, we are going to hold two interim conferences, which again we plan to do, those conferences are going to be on subjects that are actually chosen by the community, and then we are going to have an annual conference in January of next year. So that is one of the things we are doing, and we are actually setting up internet access, so that people can share ideas. So I think that is working well, but it is work in progress. As I indicated to you, we have reason—although the data is so poor, you can say little more than that—to believe there are probably something like 16,000-odd members who have a background in science and engineering skills in government as a whole, but we cannot identify them in any particular way. We are trying to identify them by this self-selection process, and I think that is happening. I was encouraged that in the first relatively early days of the exercise, we brought in about 10%, and we are shooting for 20% next time. I think that that will go, and I have hopes that we will exceed that target of 3,000, but I think it is a judicious one.

Q323 Mr Boswell: Thank you for that, and thank you for reporting progress, because we expressed some interest in that earlier. Can I just ask either Paul or yourself, John, whether you have made any progress or whether you think there is any progress to be made in developing a general metric about what you might call the science footprint within government? I mean, how do you know whether you are making an impact or not? The Minister said he was, and I am not disposed to argue with him, but how could we actually set about measuring that kind of input?
Professor Beddington: I suppose there are a few that are worth highlighting. The first one is the fact that we have succeeded in embedding chief scientific advisers almost in every main department of state. There are four advertised at present. One will be the new Department of Energy and Climate Change; the other is the Foreign Office, and there were interviews for that last week, for which I was on the panel; the next one is MI5, where I had to interview and explain it was not involving designing weapons systems for Aston Martins.

Q324 Dr Gibson: Did they check your record first? Student revolts, no doubt.

Professor Beddington: They may have. And of course there will be a replacement for Michael Kelly at CLG which is going to be coming up. So really the only large department of state that does not have a chief scientific adviser is now the Treasury, and we are now talking to the Treasury about how that might be implemented, given its rather different brief. So that is one activity that I would focus as being some achievement. The second one is to do with science reviews, and as I discussed in a previous session to this committee, I felt they were too long, too detailed, and therefore, we wanted to move to another form, which is a faster assurance, which will be much more at a higher level but shorter, and we reached agreement about two weeks ago that these would be mandatory for any department or institution that has not actually already had a review. For those that have, like DEFRA and so on, we are in the process of ongoing assessment of how they are performing against a particular review, but it was agreed, in the civil service board which runs such things, that all departments that have not had one will be mandated to have one. The aim is to complete this exercise of having done a science and engineering review of all departments by March 2011, so it is a relatively quick timescale to get them, and this includes things of very different sizes, it includes the Ministry of Defence and the Treasury.

Q325 Mr Boswell: Will you give some thought to whether you can publish some of the material arising from that? I am thinking for example of the kind of capacity reports which have come out of the Treasury and Cabinet Office in the past in relation to individual departments.
Professor Beddington: The policy is to publish. The plan would be that we would publish these reports -- the one exception is the intelligence agencies where we would not obviously.

Q326 Dr Gibson: As I understand it, John, you are talking about people who are in post at the minute, distributed about the Whitehall centres, departments, but I am looking at the young graduate who is fed up and does not want to do research at the bench, but has a real understanding and is a hot shot, man or woman, who wants to get into this. You know, there are lots of people in this country who want to get into putting the ideas of science over from their youthful experience, be it PhD students or post-docs. What are you doing about them? Are you recruiting at Hull, recruiting at Newcastle, looking for more, or are you just recruiting from inside the beltway here?
Professor Beddington: I cannot answer in terms of actually going out to recruitment. As far as I am aware, that does not happen, I think it is open advertising. I have certainly not been involved in this.

Q327 Dr Gibson: But would you like it to happen?
Professor Beddington: I think it is an interesting idea, Chairman. As far as I am aware, some departments do that, I think the Ministry of Defence actually goes out and looks at it, but I cannot answer for government as a whole. I think there is enormous opportunity. I think the chance of getting science and engineering graduates into the fast stream, we discussed, I think, the last time we met here, I would strongly support it. I think we need to think about how we can open that up, and I am more than happy to give a commitment to go away and think about that.
Dr Gibson: Anybody else want to follow that up?

Q328 Dr Harris: I just wanted to ask you about how important you think the independence of scientific advisory committees is, reflecting back on the Phillips report into BSE, and how important you think the independence is of advice to you, Lord Drayson, and the people that you talk to, Professor Beddington.
Lord Drayson: I think it is very important that the advice is independent, not just to myself as Science Minister, but to all ministers within government. It is a very important resource, it is a resource that this country is well endowed with.
Professor Beddington: We have a lot of science advisory committees in government, of the order of 100 or so on particular subjects. Only a few departments have science advisory councils which span across the individual departments. The ones that do that are the Ministry of Defence, the Home Office, DEFRA and the Food Standards Agency. They are the only ones that have, as it were, a science advisory council that deals with everything. There are many individual committees in many departments which deal with sub-sets of subject areas.

Q329 Dr Harris: What do you think are the characteristics of an independent scientific advisory system, for example, that guarantee its independence? What are the key factors that need to be there, that they can be independent and be seen to be independent?
Professor Beddington: I think the first thing is the appointment process clearly has to be independent. Some of them are appointed under Nolan rules where they are paid, some of them are actually appointed in other ways. I think there are some guidelines that were set out for the behaviour of science advisory committees which my predecessor developed, and I think we are planning to keep those under review. I think we need to do that.

Q330 Dr Harris: Do you have anything to add to the response to my question, which was: what are the essential ingredients in ensuring that scientific advice is independent and seen to be independent?
Lord Drayson: Publication of results of that advice.

Q331 Dr Harris: What about the idea of giving advice without fear nor favour, as it were? What about the situation where someone might be concerned that they would be publicly attacked by the minister or government for the nature of their advice, because the minister disagreed with it? Do

you think that might lead to questions about whether future advice is independent or seen to be independent?

Professor Beddington: I can probably answer this, because actually the instance that was probably of considerable concern was when the Home Secretary criticised Professor Nutt for an article he wrote, and I wrote to the Home Secretary about that, indicating that I had real concerns that this affair had the potential of being used both widely and in the media more widely as a discouragement for people wishing to become members of science advisory committees. She responded to me in indicating that she felt that she supported the idea of independent advisory committees, and she felt this had been evidenced by her support of a number of individual recommendations of Professor Nutt's ACMD committee. I still feel that we need to be exploring this, because I think that where you have a publication which is in an independent peer reviewed journal, I think it is unfortunate for government to actually criticise that in Parliament. So I would concur with, for example, the comments that Lord Krebs gave you when you asked him about the same subject. However, I think that in terms of whether in fact this particular instance or others like it, and I know of no others at the moment but you may be able to illuminate me, are genuinely discouraging a set of people who might previously have wanted to sit on science advisory committees, that is not a thing that I have noticed or people have actually mentioned to me. Certainly in terms of the concerns that you might have about the general issue of independence of scientific advice, in the recruitment that we have been doing for chief scientific advisers, there seems to be a genuine enthusiasm and a very good set of candidates for that. I think you took some evidence from Professor Gaskell about DEFRA, who indicated that in people applying to be on DEFRA's science advisory council, there was real interest in there, but, of course, there may well be a cohort who are discouraged, but it is hard to work out how we would actually do that. But I think it is essential that the independence of science advisory committees are maintained, I think as Paul has indicated, they should publish their advice, unless there are national security reasons for not doing so, and I think that is one way to ensure it.

Q332 Dr Harris: I am grateful to you for setting out what you have done, and that is interesting, because I was not aware of that, and I am not sure the Committee was aware of that. That cannot be entirely private correspondence, because you have summarised it, or at least you have given a summary of it today. Is that as far as you are going to go in respect of letting everyone know, including the scientific advisory world and indeed Parliament, what your concerns were? Would you publish the correspondence?

Professor Beddington: I think in publishing the correspondence, I would obviously have to consult the Home Secretary, but I would be prepared to consult the Home Secretary and come back to you.

Q333 Dr Gibson: Before it is published, is that insisted on, are there guidelines about that?

Professor Beddington: I think it would seem to me to be polite that if you are corresponding with somebody, you should actually ask their agreement whether you would publish both your letter to them and their response.

Q334 Dr Harris: I would accept that. From the summary you have given, it looks as if you raised concerns, which I understand, and the Home Secretary did not say -- and you will have to correct me if I am wrong -- that she regretted attacking him, criticising him, shall we say, on the floor of the House in the terms that she did, nor phoning him during his out-patient clinic, and I put it politely as request, but I think if you read it it is probably demand, that he apologise for publishing the article in the terms he did. Am I correct that there is not such regret expressed in the response?

Professor Beddington: I would have to check it, but certainly my memory is that the Home Secretary indicated her strong support for the independence of scientific advisory committees, rather than that she believed she had made a mistake.

Q335 Dr Harris: You have indicated that you do not think this will have an impact on recruitment, and let us leave that aside.

Professor Beddington: I am sorry, Dr Harris, I said I do not know.

Q336 Dr Harris: But there is a separate question -- because I do not want to pursue that recruitment issue -- that the worry is in future, particularly in this department, shall we say, or with this Home Secretary, if one wants to avoid getting that response, they are going to have to not publish what they would otherwise publish, or they might be under pressure to give different advice, such that they are not personally criticised. Is that a concern that you recognise might exist, and would you be concerned about it?

Professor Beddington: I think this was a particular issue. As I indicated in an earlier response, I have not noticed that occurring widely, and therefore, I think one can decide that this is probably a particular issue and may not occur again. I think that would be the hope.

Q337 Dr Harris: My final line on this particular issue, on the ACMD, is that it struck me—I mean, I agree with what you wrote in your letter, let me be clear about that, I will put that on the record, as I have before, and that was a private letter that you wrote to the Home Secretary. There was not a public declaration, as far as I know, of support from you or from the chief scientific adviser at the Home Office, nor from the council of the Home Office scientific advisers, the chairs of which get to meet, and they are presumably there to support each other. But I am certain that is the case, and I am just wondering whether you are surprised that there was not that support for him from within the scientific advisory system, or were they aware that you had written

privately to the Home Secretary, and perhaps you had said something privately to Professor Nutt, I do not know, offering him support, because I imagine it must have been a difficult time for him.
Professor Beddington: I cannot give you any indication about how much this was known within advisory committees in the Home Office, but I did share my intention to write to the Home Secretary with Paul Wiles, who is chief scientific adviser at the Home Office.

Q338 Dr Harris: Because I think it is important -- would you accept arguably that if people out there know, and you have made that clear now actually, usefully, that you are there to protect them if politicians, and we are a terrible bunch of politicians, and I include the opposition parties in that, start behaving politically on science matters, that you are there to support them, privately and perhaps publicly, that will actually help ensure that there is confidence that they can give the advice that they wish to give without fear or favour?
Professor Beddington: I did not write to or contact Professor Nutt, and I think perhaps in retrospect I perhaps should have done. I did not. So to that extent, I am more than happy to share my concerns with this committee. I think that it is important that people are allowed to publish in peer reviewed journals without being criticised.

Q339 Dr Gibson: Does this happen quite a bit then?
Professor Beddington: Not that I am aware of, Chairman.

Q340 Dr Gibson: I did not know, but Tim O'Riordan the other day, you probably know about coastal erosion, and he was saying similar things, that it was very difficult to say things because they had implications at a government level, so therefore you had to weigh it up.
Professor Beddington: I am not aware of that, I am afraid.

Q341 Dr Harris: It is a question of academic freedom, to a certain extent, is it not?
Professor Beddington: Well, there is academic freedom, which is where you publish and peer review, and then there is an issue of a responsibility if you actually have a particular public position. I do not think in this case there is much one can do to explore this in any detail. This is a particular instance, but I think it is a thing that we have to watch, and I think if this happens again in another situation, I may choose to act in a different way. I felt this was the appropriate way to respond at the time, which was to write to the Home Secretary and express my concern.
Dr Gibson: Let us move it along.

Q342 Mr Boswell: We are moving along. It will sound like nuts and bolts, but I think you will realise that it is pretty cardinal to what we are looking at. First question to you, John, and I am not sure I know the answer to this, so I am not asking the question as if I do: you as chief scientific adviser, do you report directly to the Prime Minister?
Professor Beddington: Yes, that is correct.

Q343 Mr Boswell: In practice, who do you actually see more of? Is it John Denham, as Secretary of State, or the Prime Minister?
Professor Beddington: I have seen the Prime Minister I think on four occasions in the last year.

Q344 Mr Boswell: About once a quarter?
Professor Beddington: Yes.

Q345 Mr Boswell: Not regularly, not diaried in?
Professor Beddington: Not at all. But I obviously see John Denham and Paul much more regularly. My line management within the civil service is to Sir Gus O'Donnell, who I see much more regularly.

Q346 Mr Boswell: If you were to have a major concern, and I will not hypothesise what it is now, would you seek an appointment with the Prime Minister, to say, "This is cardinally important, I need to see you and brief you about this", rather than as it were going up the line?
Professor Beddington: Yes, I would.

Q347 Mr Boswell: You would not be at all frightened of doing that?
Professor Beddington: No, and indeed I have written to him on a couple of occasions about things that I felt were really important and should be treated as such.

Q348 Mr Boswell: If we turn to the latest Council for Science and Technology report, which is the one on the relationship between academia and government, pretty central, who commissioned that? Would that have been John Denham or the Prime Minister?
Professor Beddington: That was John Denham.

Q349 Mr Boswell: But presumably Number 10 would have known about it?
Professor Beddington: Yes, there is a group which meets regularly to deal with commissioning government reports, which also includes foresight, horizon scanning, work of this sort, as well as the strategy unit.

Q350 Mr Boswell: Is that run by the Cabinet Office then?
Professor Beddington: Yes, it is chaired by Jeremy Heywood, which is Number 10, I guess. Just to complete, I think the CST essentially see themselves as a body that if ministers of state ask them to do something, they will examine it, to see whether this is an appropriate thing to be doing. When the CST met with the Prime Minister last year, he specifically asked that the CST did a report on infrastructure going into the future, and they are working on that now. So it is a mix, and I think they are available to do it. Indeed, some come from their own agenda, which is important for independence.

Q351 Mr Boswell: So it is not purely reactive? They can generate?
Professor Beddington: Indeed they can, and for example, they did one on innovation in the water industry, which I think was generated entirely from themselves.

Q352 Mr Boswell: Officials and advisory councils who are supposed to report to the Prime Minister, is it important that they actually physically report to the Prime Minister, rather than the report mediated through a Secretary of State?
Professor Beddington: I think from time to time it is a very good idea that an organisation like the CST meets with the Prime Minister, and they certainly felt that, and they indicated to me pretty early on in my time with them that they felt that they would like to be more involved. I think you have had evidence from some of the members, not necessarily in this inquiry, but in a previous one. I think that is very much the feeling that I have, that this is a very well qualified body, I think that they can actually make a difference, and I think that there is real opportunity when they engage with the Prime Minister on a one to one basis. I can also say though that they also have a practice of having both ministers and senior civil servants to dinners, they have a dinner before each meeting, and people are invited. So, for example, Jeremy Heywood was invited to one, and Paul and John Denham were invited to another one, just some of the recent ones.

Q353 Mr Boswell: I think some of us would say -- you may or may not wish to comment on this -- when we went to Japan, we were very struck by the analogous institution there, who were -- I will not say seeing the Prime Minister every month, but certainly had ready and frequent access in a way that I think is not historically applied here, although it may be coming. Do you have any comment on that?
Professor Beddington: Yes, I think we need to be thinking also about other analogies. I am going to America next week to see John Holdren and the PCAST (DN spell out) group. Advising the president there has a different frequency, and I think one of the things that I am rather keen to see happen is that we actually engage and start to think what is best practice.

Q354 Mr Boswell: This one is probably for Paul Drayson, although you may wish both to chip in. Do you feel now that GO Science might be better placed in the Cabinet Office?
Lord Drayson: I think John is best placed to speak from GO Science's point of view, but from my perspective as Science and Innovation Minister within DIUS, it is really excellent having GO Science in the same building, it enables me to develop a good and strong relationship with the government's chief scientific adviser. So although geography is not everything, I think actually having GO Science together with DIUS has its advantages.

Q355 Mr Boswell: John, do you want to add any comment?
Professor Beddington: Yes, I have answered this question before, and I think there are merits on both sides, but I think the key one is the link with both the Science Minister and the Secretary of State for DIUS, but also with the Director General for Research Councils, Adrian Smith, and that whole team, which are responsible for so much of science funding. The fact that I can walk up a floor and find Adrian Smith and his team and talk on a day-to-day basis makes a tremendous difference, whereas if I was down in Whitehall, that would be rather more difficult to do. I think that the other aspect of it, which is easily ignored, is also it is not just myself seeing Adrian Smith, but it is my officials seeing his officials on a regular basis, and I think that is the real advantage of this co-existence.

Q356 Dr Gibson: Do you have spats together, or are you just chummy-chummy? Just to get a feel of the kind of meeting.
Professor Beddington: Well, you have seen Adrian Smith, he is a tough man to have a spat with.

Q357 Mr Boswell: You have frank exchanges though.
Professor Beddington: Yes, I do not think we have disagreed fundamentally on anything, but we have, as you say, frank exchanges of views, and Adrian obviously sits on the group of chief scientific advisers that I have. One area which I did explore with him very soon on in his tenure was the importance of independent assessment of the science budgeting process, and he and I talked a lot about that. As I am sure he will have told you, his plan is to consult with a number of entities, including the Council for Science and Technology, obviously the Royal Academy and the Royal Academy of Engineering, but also the team of chief scientific advisers. We talked long and hard about that, because one alternative might have been to actually have, as it were, a group of individuals who were charged with some degree of assessment of that science budgetary process, and I think that we evolved this as a solution, and I think I agree with it.

Q358 Mr Boswell: Can you also express adequately the cross-departmental role of GO Science, given that you are located in, although I appreciate you are not formally part of, a department? This is partly, I think, a matter of substance, but it is also a matter of perception, in that if you are another department, be it the Home Office or DEFRA for example, are you seen as them and not part of us, if you see what I mean?
Professor Beddington: I think I can probably do it by example. Quite a lot of the last two or three weeks has been spent dealing with swine flu. I went in and immediately discussed it with the Department of Health, and it was agreed I would chair an independent science advisory group in emergencies. I am co-chairing it with Sir Gordon Duff, who was chairing the independent group on influenza. So I chair now an independent group, I have co-opted independent scientists on to that, that is the group that independent of the Department of Health and

HPA provide advice to COBR on this particular pandemic. So that is the role that I play there. In the case of other activities, for example I have been quite closely involved in providing advice on aspects of the CONTEST strategy, which is straight into the Home Office, and I have been involved in regular meetings, I sit on the CONTEST board and I sit on the science and innovation board of CONTEST, so there is a fair engagement with that. In the case of DEFRA, I have been making one of my agendas to be the importance of food and water in the future, and I think DEFRA are well aware of that, but I also chair the research panel of the food strategy taskforce of the Cabinet Office, and I go to -- sorry, I am going on and on, but I attend MoD's science advisory council, and so on.

Q359 Dr Gibson: Do you ever get back in the lab at all? Do you ever talk to young people in the lab? David King used to say he did that on a Friday at Cambridge. Have you got a chance to do that, with all these committees?
Professor Beddington: I certainly do not get a chance to talk to anybody in a lab because I have not been in a lab since I was about 17, wearing a white coat, but I certainly talk to modellers and people of that ilk at Imperial College. But you raise a good point, Chairman. I have been down to visit a number of laboratories, where I really think it is important to actually find out what people are doing, what they are thinking; you know, these are civil servants, and what excitement there is. So I have visited Rutherford Appleton, I have visited Culham, I have been to Pirbright, I have been to VLA, and so on.

Q360 Dr Gibson: You have been around a bit.
Professor Beddington: I am trying to get around.

Q361 Mr Boswell: I think we would encourage that.
Professor Beddington: I think it is enormously important, and actually I try to ensure that I do not just talk to, as it were, the director of the lab and the three senior people, but I make certain that I actually talk to individual scientists and engineers.

Q362 Mr Boswell: Thanks for that. Just a footnote, if I may, on the departmental chief scientific adviser, really a question about the signal to the scientific community and the general public, that science advice is taken seriously by the government. Does it add value substantially? I suspect the other point which I would add into that is the impact on lay policy-makers and civil servants who are administrators and do not have specific scientific knowledge, are they being trained to take what you and your colleagues are saying seriously at an early enough stage to influence policy?
Professor Beddington: It is a hard question to answer in general for government as a whole, but I would think in some instances, it is really quite feasible to say I have been quite pleased.

Q363 Mr Boswell: But you might, for example, yourself, take an interest in the strengths and weaknesses of this good practice or bad practice.
Professor Beddington: Well, for example, I think in the new Department of Energy and Climate Change, I was very concerned that the plans for the Severn Barrage were not being discussed at a sufficiently sophisticated scientific and engineering level involving policy people, so what I have done is put together a team of people, which Brian Collins, one of the CSAs, will lead, to actually look and work with the group that are actually working to evaluate options for the Severn Barrage and will be linking closely with policy people.
Mr Boswell: That is fine, thank you.

Q364 Dr Harris: Lord Drayson, I was just reflecting on the answer I got from John Beddington. The Government Chief Scientific Adviser writing to a fellow member of the Cabinet to complain essentially about action taken in respect of an independent scientific adviser is unprecedented. Although I know it may be awkward for you to talk about that specific case, I am just wondering whether you, as Science Minister, with responsibility for this area, have a plan to try and stop this happening in the future? Because the letter was *post facto* firefighting.
Lord Drayson: I support what John has said with regard to the importance of the way in which such advice is commissioned, in terms of ensuring its independence; also the points which you have made, in terms of people feeling that they are able to, without fear or favour, provide that independent advice. I am pleased that this is something which, in his role as chief scientific adviser, he has taken very seriously and has responded to. As he said, it is something which we need to monitor carefully.

Q365 Dr Harris: I suspect if we see the correspondence, and of course we will be asking the Home Secretary, we might ask her directly to publish it to us, if there is no regret or acceptance that something went wrong, then there is a clear disagreement between one of the senior secretaries of state in government and the chief scientific adviser. Can I say, it is healthy that at least we know about this, although I understand that there are issues attached to it. That is an unsatisfactory situation if it is not resolved in one person's favour or the other, because it is unresolved and it might happen again. Do you have a plan to provide more guidance to colleagues to prevent it happening again?
Lord Drayson: I do not have a plan at present to advise colleagues in the way in which you suggest, Dr Harris, because I am not aware that this is a wider problem. This issue has come up in this particular instance, John in his role as chief scientific adviser has responded to it, but I share his view that it is something which we need to monitor carefully, but I do not believe that it is indicative of a wider problem.

Q366 Dr Harris: Turning to the issue of the debate on strategic science funding, which you kicked off publicly in a prior session before this Committee, which we remember well, can you clarify whether what you were saying was, shall we focus more on strategic research priorities, or how shall we do it,

because we are going to do it? Could you first clarify that? If it has changed, then could you clarify whether that question has been answered, or changed?

Lord Drayson: Yes, it is the former. My point in raising the topic as a debate was to stimulate a serious debate about whether or not the science community felt that we should apply more focus to decision-making around research priorities, and also to encourage them, should they come to that conclusion, as to make recommendations as to how that should be done.

Q367 Dr Harris: Have they come to that conclusion, in your view?

Lord Drayson: In my view, the whole process of raising this topic for debate has been a successful one. Research Councils UK announced today their conclusions relating to the debate. The feedback that we have had from the wider scientific community regarding research policy I believe has been very healthy. It sets a model for how, in future, as we go through spending rounds, we should do what I believe this committee has recommended in the past, that we have a wide debate, encourage those inputs, and the response that we had as a result of kicking off the debate, for example, from the members of the Council for Science and Technology, from the learned societies, from the research community as a whole, I think has been very helpful.

Q368 Dr Gibson: Suppose I said that you had already made your mind up, I know you are a determined individual, but the debate is where it goes, when you focus it, where does it go? That is what the debate is.

Lord Drayson: One of the things which I learnt as part of the debate, how important it is for the Science Minister to repeatedly communicate the principles by which he or she is operating, because what I found as the debate progressed, certain things were being characterised as a question of, for example, pure versus applied science, which was never what I said in my original speech, and I have continually had to repeat this. I have also repeated, as I said in my speech, I did not see that this was something which ministers should be deciding, this should be decided by the research community, but it just goes to show that you have to keep on saying the same thing again and again to make sure you are understood.

Q369 Dr Harris: Do you think a Green Paper, in retrospect, where it could have been crystal clear that this was a suggestion, that it was not about pure versus applied, that this was a genuine consultation, would have been beneficial?

Lord Drayson: I have thought about this, and in retrospect, no, I do not. I think that the way in which the debate was able to be initiated as quickly as it was by the method which I took, the way in which it was very effective, I must say, in stimulating response, so there was no shortage of response to the debate, in fact it had a useful by-product, I believe, in contributing to the raising of the overall profile of the importance of science as part of the debate about our response to the economic downturn.

Q370 Dr Harris: Clearly you can do things quicker without a Green Paper, I understand that. From what you have said, it looks like you have not yet reached a conclusion on the question; you have had some responses from the scientific community informally and I guess formal responses from Research Councils who represent research councils, is that right, you have not reached a conclusion, and when you do, can we hope for a White Paper, or is that—

Lord Drayson: I do not want to give the impression that this is a process by which government will come to a conclusion at a point in time. This is a process by which I have asked, through this debate, for the research community to consider the issue relating to prioritisation.. The research community has provided that feedback. That information has then been fed back through the research councils. It is then for the research councils to make their determination of the allocation of research funding—

Q371 Dr Gibson: But is the debate over, Paul?

Lord Drayson: I believe this is a debate which we must continue to refresh. So therefore I do not believe that it is a debate that stops at a point in time.

Q372 Dr Harris: Let me be clear, there is not going to be a government policy announcement?

Lord Drayson: No.

Q373 Dr Harris: So far as I understand it, the bulk of this feedback has not been published in one place and summarised, like normally happens in consultations, but stuff has been sent back to the research councils, including their own views?

Lord Drayson: I would be happy to publish. Some of the feedback has been put in the public domain. If you would like me to determine whether all of that feedback can be put in the public domain, that is something which I will—

Q374 Dr Harris: Yes, in a coherent way. What you are saying is this will be for the research councils to decide, based on the debate you have stimulated and the responses to that debate, and you are not giving them a steer?

Lord Drayson: Absolutely.

Q375 Dr Harris: And you are not giving them a steer because you do not believe it is right for you to give them a steer, or why are you not giving them a steer?

Lord Drayson: Because I do not think it is right for ministers to be determining the research priorities in this way. I think it is right for the research community, through the independence of the research councils, through the peer review process, to make these judgments.

Q376 Dr Harris: That is interesting. On the timing, it was badged initially, perhaps not by you, so this is your chance to be clear, that this was a response to the recession, and if this was implemented, and I must say I thought it was a government policy proposal, but you have clarified that now, this would help us out of the recession. Is that the timing, or if we are out of the recession next year, is this more than simply a mid-recession response, and something that is substantive for the future?
Lord Drayson: The reason for me raising the debate at the time I did was because of the developing economic downturn, and the raising, if you like, of the question generally of what is the appropriate response by governments, not just this government, but governments internationally, to this global downturn. I believe that the process that we have been through in this case has provided us with a useful model which we can use in the future. I do believe as we go through future spending rounds, it would be a good process. It is one which I hope we will be continuing to consult in this way. The feedback that we have had from, for example, the learned societies, and the other groups, has been extremely productive, and so this is something which I think we should embed in our process in the future.

Q377 Dr Harris: Finally, can you guarantee that the funding for curiosity driven research will be ringfenced in the future?
Lord Drayson: The funding for research is ringfenced. That is one of the, I think, important decisions that have been made recently by the government to maintain the science ringfence in the recent budget statements, and as set out prior to that by the Prime Minister himself. In terms of the government's commitment to fundamental, pure, blue-sky research, however you want to define it, that commitment remains. It was never my intention within the area of raising the debate about focus to make the distinction between pure and applied research. I think I have gone on record a number of times now saying how I recognise the importance of fundamental research. The balance of fundamental to applied research is a judgment that the scientific community, through the research councils, need to make, based upon their judgment of excellence within the particular branch of science which is being considered.

Q378 Dr Gibson: You believe they are capable of making that decision?
Lord Drayson: Yes, I do, I have confidence in them to do that.

Q379 Dr Harris: And you are not throwing hints about economically productive research being something they should favour?
Lord Drayson: I am not making hints about my belief that there is some association between economically productive and pure and applied, or pure or applied. I think that is the linkage which people are trying to make the jump to, but which I do not accept. I think we need to be clear as to which branches of research, based upon excellence in science, based upon excellence within our scientists, in terms of the global environment, and those judgments are rightly made through the peer review process.

Q380 Mr Boswell: At the other end of the spectrum, there has been some concern expressed about the capacity of government departments to carry out their own science research, which in a sense may be more related to the immediate purposes of government, or to competitiveness. I think what I am feeling after is whether you need a more articulated approach with lots of curiosity-driven at one end, and a bit more development at the other. Do you see this as a difficulty, and is it something that you as Science and Innovation Minister can drive and get changed?
Lord Drayson: Yes, I think this is an area for concern, that whereas I have expressed my confidence with regard to the centrally funded science ringfenced budget, I am concerned about some of the trends which we have seen in terms of science funding within government departments. I think this issue was recognised some months ago. We have addressed that through the mechanism of the new science and innovation Cabinet sub-committee, which I chair, of which John is a member, where we have been reviewing departmental plans for research, we are going through a process whereby we are requiring each government department to be updating the committee on its future plans, and we have been in particular addressing a clear deficiency, which I have highlighted to the Committee previously, around the mechanism within government for cross-departmental scientific research projects, and I think we have made some good progress on that.

Q381 Mr Boswell: And you will keep a degree of transparency on that, within the normal limitations of government?
Lord Drayson: Yes.

Q382 Graham Stringer: If I can just go back very briefly to Evan's first questions about scientific controversy and what your reaction was with Professor Nutt, in a sense I am more concerned about where there is not public controversy, when the government has used pretend science, and how you intervene to say, "This really does not have a proper scientific or evidence base to make future policy". I can give you one example, possibly others. When the government announced its Every Child a Reader programme, I cannot quite remember the title, they did some research which essentially put quite a lot of money into remedial teaching of literacy, and there were no control groups. Having put however many million pounds into that in however many schools, they said after that, the children read better, therefore we know how to proceed. That is not scientific, without control groups and comparisons, that is just wasting money on things we already knew. Not for the children

involved, but as the basis of an experiment. When you see an obvious misuse of science like that, how do you intervene?
Professor Beddington: Well, it is an example I am not familiar with, I should say at the outset.

Q383 Graham Stringer: It is in the literature.
Professor Beddington: Yes, I understand. I was explaining that I am not familiar with it. I can become so. I think that where science appears to be done badly, it is important that I should draw the attention in this case to the chief scientific adviser in the appropriate department and say, "This looks to be rather poor". I have not done so, because I have not looked at it, but I am more than happy to raise this, and I think the issue is really one that is quite important, and one of the reasons why it is important, I believe, to have chief scientific advisers in every department is that where bad science is done, we can actually raise that issue with the chief scientific adviser of the relevant department, because that is where the responsibility lies, but ultimately responsibility lies with me, but if these things happen, and this particular one I was not aware of, I think it is important to say this research is not adequate to justify the policy.

Q384 Graham Stringer: That begs the question, does it not, what mechanisms have you set up to find out where there is pretend or bad science going on?
Professor Beddington: One of the key things we have done is to set up these science reviews of different departments, and they were rather long ones where we looked at a lot of examples, and indicated bad or good practice, and indicated where we were concerned about how scientific advice was being developed and used. Those reviews are going to be much quicker now, and I am hoping to cover all of the main departments within the next two years. So that is one mechanism. I do not have a mechanism for looking at all science developed in government, I see that as devolving to the responsibilities of the individual chief scientific advisers, but I would think if something which, as you characterise it, is a rather gross omission of sensible scientific practice, then it needs looking at. It is obviously in the area of social statistics, and Paul Wiles is the government chief social science adviser, but he sits on my advisory group, and it seems to me that is the sort of area where we should actually be doing it. I certainly would not try to defend the idea, or use it to defend that there are some areas that we do not have the time to look at. We have to deal with that.
Graham Stringer: I take it then that you will look at that.
Dr Gibson: Can you just take two points, Graham?

Q385 Graham Stringer: When the Committee was in the United States, we asked the questions that we had been asking the government for some time about regional science policy, whether there should be, as part of the grant allocation to scientific bodies, an understanding about poverty or deprivation in the region they are going to, whether that was relevant. The government has come back each time and said we allocate money according to the Haldane principle. What we found in the United States was a completely different system, where they had a block of money that they gave to the scientific elitist states, the Massachusetts and Californias of this world, and then another block of money, nearly as large, which they gave to those states that had universities doing scientific research, but were not the Harvards and Caltechs of this world. Would the government relook at considering the Haldane principle against that evidence?
Lord Drayson: No, I think is the direct answer to that question. I think that when one looks at the productivity of UK research and the strength of science in the UK, considering the size of our country, the resources which we put into it, we believe that the principle of funding the best possible science, excellence in science, wherever it is regionally, is the fundamental pillar which has led us to the very strong science base that we have. So changing our policy in the way in which you suggest, whilst recognising that that is the way in which the United States, for example, pursues it, that is not, we believe, the right way to go for the UK.

Q386 Graham Stringer: But do you not think that in those circumstances, and we have had this debate before, I do not want to push it too far, you are just intensifying the concentration of excellent research in the south-east triangle of London, Oxford and Cambridge, the golden triangle, at the expense of the rest of the country, where there is good research done, but it gets increasingly difficult to compete with ever increasing amounts of money going into scientific research in those three areas?
Lord Drayson: I recognise the concerns, and as you say, this is something which has been part of national debate around science for some considerable time. I believe that we as a country cannot really afford to be competing internally within the United Kingdom. We are competing internationally, we need to generate the strongest possible research communities based around excellence here in the United Kingdom, and the way in which we have seen excellence prosper within our universities, the fact that we have such a disproportionately large number of universities in the top ten, for example, in terms of global rankings, reflects the effectiveness of our policy.

Q387 Graham Stringer: In debate with the Committee about the Haldane principle, John Denham in April 2008 said that one of the safeguards of guardians of the independence of science and academic freedom was the research councils. Professor David Edgerton when he came to the Committee said he thought that was curious, and did not really believe it was the job of the research councils, that independence and academic freedom came from academic societies, universities and individual academics. The job of the research councils was to allocate funding. Do you not think, when there is debate both about the regional allocation of funding and what the Haldane principle means in the allocation of funds, that

government should not take another look at the Haldane principle, and have an open debate and discussion about it?

Lord Drayson: I think that there has been considerable debate about the Haldane principle, the mechanism by which this government, in the context of other government policies, makes decisions about allocations of science funding, but I agree with the point that academic freedom is also in the hands of the learned societies, academics themselves. But I do believe, and my experience as Science Minister certainly reinforces that belief, that the independence of the research councils are an important contributor to this, and therefore the so-called Haldane principle is alive and well and effective in these changing economic circumstances. The fact that we have gone from a period of very high growth to one which is presenting the country with really quite significant but different challenges, and that we are confident that the principle by which research funding allocations have been made remains effective in that, I think speaks to the effectiveness of these principles.

Q388 Dr Gibson: The last question is about the science and society consultation. I seem to have spent years listening to all of this. Is there anything different coming out of it or is it just money down the drain in your opinion? What have we learnt about the recent consultations?

Lord Drayson: I think the most interesting new information from this consultation is the general view that there is a greater role for Government, and I would say that is probably counterintuitive, and therefore surprising, but that is indeed the feedback. In other words, the community whilst, absolutely as one would expect, sharing the need to develop a scientifically literate society and raising the profile of science made the case pretty clearly that there was an expectation that Government would be more involved in ensuring co-ordination and some consolidation of activities. I would say the primary feedback, which we are and will be acting upon, is to try and get greater synergy between the myriad of schemes that exist to promote science and develop a scientifically literate society. We have had the example of that in terms of the Big Bang Fair promoting science and engineering to young people. We are encouraging a number of different organisations to work together which had been separately trying to promote science and engineering to children at school and I would say this is going to be, if you like, the overriding theme of the output from the science and society consultation.

Q389 Dr Harris: Professor Beddington, when you have been with us before we have talked about the role you may play in scrutinising the scientific rigour of other departments, as you know. I just wanted to come back to your and my favourite topic, which is homeopathy. Do you think it is right that homeopathic treatments for which there is no evidence that they are effective should be allowed to claim that they are effective and have that claim approved by none other than the MHRA which is responsible on a fact-based judgment, it says, for ensuring that "We license safe" obviously, I do not think there is any question about homeopathy there, "and effective medicines"? What is going on?

Professor Beddington: What is going on at the moment is, first of all, I did write to the Chief Medical Officer about this indicating that I was concerned there was a misunderstanding between the Committee and I that you appeared to think in some comment that I was defending the use of homeopathy, which I was not, and I hope that has been clarified. I indicated to the Chief Medical Officer that I had real concerns that homeopathy which had no scientific justification of its mechanisms was being used. He wrote back to me to indicate that he believed this was a decision to be taken by individual health authorities and individual physicians. He indicated to me the scale of the problem—and I cannot quote the exact figures—was something of the order that in 2007 the cost of homeopathic medicines to the National Health Service was about £390,000. Clearly that massively underestimates the amount that is being spent by individuals, but in terms of a cost to the National Health Service and their bill it is £390,000 in £8.4 billion or something of that sort. Subsequent to that I have taken this issue up with the Director General who is dealing with these matters, Professor Harper, to say can we explore this further, and we have had one meeting on this issue. If we had not then had swine flu arrive we would be continuing to follow this through. I am also in the process of reading *Trick or Treatment* by Singh and Ernst, which I am thoroughly enjoying, and am looking at these issues. There are some difficulties, but I certainly recognise that this is an issue I should look at that.

Q390 Dr Harris: I am grateful for that but my question was about the MHRA issuing a licensing for Arnica and the label will now read: "A homeopathic medical product used within the homeopathic tradition for symptomatic relief of sprains, muscular aches, bruising or swelling after contusions". Professor Ernst, who wrote that book, published a trial—it may have been a systematic review—in 2003 that showed no benefit from Arnica in the prevention of pain and bruising after surgery for carpal tunnel syndrome, but with more adverse events in the Arnica group, if you can believe it, than in the placebo. Yet there is an MHRA stamp saying this has an indication "for the symptomatic relief of sprains, muscular aches, bruising or swelling after contusions". What is the MHRA now? This is not about the NHS now; it is just about giving advice to consumers, vulnerable consumers, people with pain and bruising. What is the MHRA now, is it a marketing aid to the homeopathic industry?

Professor Beddington: I do not know. I was not aware of this particular instance that you have cited but I will look at it.

Q391 Dr Harris: I will send you the details. Can I just say that the first reader's comment to the *Pulse* article from an advocate of homeopathy says: "The age of homeopathy has arrived. The higher vibration

of homeopathics resonates with new information and knowledge of quantum physics and the nature of water". It must be a happy day for the MHRA to have that endorsement.

Professor Beddington: I think you will expect my comments to be along the lines of your own.

Q392 Dr Gibson: Let us move on a little to think about scrutiny on behalf of the public again. Do you think there is a need for a parliamentary scrutiny of science and engineering across departments? I know you have organisations looking at this, but I guess many of us think we are missing out on these areas by having DIUS doing many different things. Do you think we need a science and technology scrutiny committee again? What is your experience? In both the Commons and the Lords they both did play their part.

Lord Drayson: The House of Lords has a Science and Technology Committee that does an excellent job. The scrutiny of science and engineering and technology within Government is incredibly important and becoming only more important in the future, but matters relating to the way in which that is put in place by the House of Commons is not a matter for me to comment on.

Q393 Dr Gibson: Do you think there is a dimension missing in this without proper overall parliamentary scrutiny in the Commons as well as in the Lords? Do you think we suffer for it?

Lord Drayson: I have not had an experience in my six months as Science Minister to lead me to that conclusion.

Q394 Dr Gibson: Are we doing a good enough job for public accountability? Dr Harris has mentioned that homeopathy is getting away with treason.

Professor Beddington: Certainly I have not found this Committee a pushover in the sense that I feel when I come before this Committee you ask me sensible, pertinent and, on occasion, quite difficult questions. Whether, in fact, the brief of the Committee, which goes significantly wider than science and technology, constrains you, I cannot judge that I am afraid. I have only experienced this since I actually arrived.

Dr Gibson: I think that concludes this session. Thank you both very much indeed for giving us your time.

Written evidence

Memorandum 1

Submission from the Department for Innovation, Universities and Skills

1. Introductory Remarks

The UK's economic success over the last ten years is based to a substantial degree on its successful use of science, engineering and innovation, whether in pharmaceuticals, aerospace and defence, communications, financial services or in a wide range of innovative small businesses. In addition the ten year framework for investment in science and innovation and succeeding policy documents have formed a strong basis for continued and increased investment in the UK's research base and in innovation, and for improving the use of science and engineering in Government.

These are policies for the long term and are being maintained through the current economic challenges so that the UK is well placed to benefit from the upturn when it comes. In addition the National Economic Council is actively seeking ways of using the UK's excellence in science and engineering to bring forward investment in industries and activities which will both reduce the depth of the downturn and put us in a stronger long term position.

This memorandum is structured to reflect the two broad related themes identified by the Committee:

— The contribution of science and engineering to Government policy, and

— Government policy on science and engineering.

These themes overlap and interact, so some of the issues discussed in the memorandum relate to both themes.

1.1 *Cabinet sub-Committee on Science and Innovation*

The importance placed on the use of science and engineering in policy-making was made clear by the Prime Minister's recent creation of a Cabinet sub-Committee on Science and Innovation (ED(SI)). Through his chairmanship of this Committee, the Science Minister, Lord Drayson will drive implementation of science and innovation policy, including ensuring that science and engineering make a central contribution to policy development. The Committee is well placed to deliver cross-cutting action, working as it does across departmental boundaries so that linkages across government on policy development and delivery are better identified and exploited. It will also serve as a forum where good practice can be shared and poor performance robustly challenged.

The Committee meets monthly and addresses issues such as innovation and procurement, R&D strategies, science and society, investing in science and innovation, STEM skills, and the management and use of science by departments. The Chair reports quarterly on progress to the Prime Minister.

2. The Contribution of Science and Engineering to Government Policy

Under the leadership of Government Chief Scientific Adviser (GCSA) Professor John Beddington, Chief Scientific Advisers (CSAs) from the lead science-using departments meet regularly to discuss strategy, current issues and priorities with each other and with Research Council and Technology Strategy Board CEOs. In addition the GCSA meets regularly with the other Heads of Analysis (statistics, operational research, economics and social research) in Government. A key objective is to identify opportunities for synergy, reinforcement, and improved delivery paths across the science and other evidence base and policy. This is more important than ever in the current economic climate.

Policy makers in Government are trained actively to seek and use analytical evidence, including that derived from science and engineering. This expectation has been formalised in the Professional Skills for Government (PSG) core skill of "Analysis and Use of Evidence" for all civil servants.

Departments and Agencies with substantial R&D spend have in place science and innovation strategies that place the role of science and engineering more clearly within the wider policy and resource context.

A Government Social Research Unit study[1] in 2007 described changes over time of the contribution that analysis (including science and engineering) generated with or commissioned by departments makes to government policy. The GSRU painted a generally positive picture but with some reservations. For example, in some cases, policy-makers did not acknowledge the importance of the evidence base, giving as their reason that it failed to provide unambiguous conclusions. In response, the Government Office for Science has

[1] Analysis for Policy: Evidence-based policy in practice (GSR, 2007) www.gsr.gov.uk/downloads/resources/pu256_160407.pdf

commissioned a project with the Risk and Regulatory Advisory Council to develop guidance for civil servants on risk, with a particular focus on risk communication and a better understanding of the opportunities and limitations of scientific and engineering evidence.

During 2008, in response to feedback from departments, there has been a thorough independent review of Science Reviews, peer reviewed by the Heads of Analysis Group and the Chief Scientific Advisers Committee. This has concluded that the time is right to adopt a two-tier system of evaluation of the use by departments of scientific and engineering evidence. These reviews will be co-owned by the GCSA and the relevant Permanent Secretary. The expectation is that most reviews will be "lighter touch", unless the department requests or agrees to an in-depth evaluation of a particular area of concern. The new approach will be faster and more focused on departmental business objectives, whilst also having the flexibility to respond to issues that cross departmental boundaries and engage more than one analytical discipline. The new approach will be piloted early in 2009.

The Government's strategy for science in Government, due for publication in the first part of 2009, will further reinforce the aim of excellent policy-making supported by a more sophisticated understanding of science and engineering advice throughout Government.

In recent years the GCSA and GO-Science have led the way in strengthening the place of science and engineering inside departments. All major science-using departments have accepted the case for appointing their own CSAs. Professor Beddington is working closely with the community of CSAs to build a cross-government approach to identifying and taking forward research priorities which address major policy challenges such as understanding and responding to the complex inter-relationships between climate change, energy, water, food, and migration.

2.1 *Council for Science and Technology*

The Council for Science and Technology (CST) is the Prime Minister's top-level independent advisory body on strategic science and technology policy issues, and engages with all Government departments as appropriate to the issue under consideration. The 17 members of the Council are respected senior figures drawn from across science, engineering and technology (including social research and economics). The CST has made valuable contributions across a wide range of key policy challenges that include its reports, *Policy through Dialogue* (March 2005), *Better use of personal information: opportunities and risks* (November 2005), *Nanotechnologies Policy Review* (March 2007), *Strategic Decision Making for Technology Policy Making* (November 2007) and most recently *How Academia and Government can Work Together* (October 2008). The Council also engages with Ministers and senior officials in a more informal way and on shorter timescales whenever appropriate or helpful. For example last month the Council met the Prime Minister and advised him informally on making strategic technology choices and addressing the challenges in UK venture capital funding in the context of the economic downturn.

2.2 *The Chief Scientific Advisers Committee and Core Issues Group*

The Chief Scientific Advisers Committee (CSAC) includes all departmental CSAs as well as the HSE Chief Scientist, the joint head of the Government Economic Service, a Treasury representative, CSAs to the Devolved Administrations and the DIUS DG Science and Research. It meets quarterly and addresses issues of common interest. For example its last meeting addressed the RCEP report on novel materials, preparing for the next spending review, horizon scanning, monitoring and evaluation of scientific advisory committees, the science review programme, the forthcoming strategy for science in Government, the IUSS Committee's report on biosecurity and the Government's response, raising the profile of CSAs, GO-Science web pages and PSRE sustainability.

The CSAC Core Issues Group (CIG) includes a sub-group of CSAs from the principal science-using departments as well as the CSA to the Scottish Government. It meets every six weeks and form sub-groups to address current issues. At present it has sub-groups on counter-terrorism and on climate change and food security. It meets at least twice a year with the Chief Executives of the Research Councils and Technology Strategy Board. It has agreed with the Chief Executives to work together on cross-cutting strategic priorities in preparing for the next Spending Review.

2.3 *Global Science and Innovation Forum*

The Global Science and Innovation Forum, which is chaired by the GCSA, includes eight government departments, UK Trade and Investment, RCUK, the TSB, the Royal Society, the Royal Academy of Engineering, the British Council and the Academy of Medical Sciences. It developed the UK's global science and innovation strategy and co-ordinates its implementation. At its next meeting the Forum will discuss the implications of the new US administration and review its forward role and work programme.

2.4 *Building the Community of Interest in Science and Engineering*

There are estimated to be more than 18,000 civil servants with science and engineering backgrounds. These form a spectrum between those who work on science and/or engineering day to day (some in a laboratory context) and those who work in other Civil Service professions such as policy delivery or operational delivery.

As Head of Science and Engineering Profession (HoSEP) in Government, Professor Beddington is co-ordinating and supporting the work of departmental HoSEPs to champion and support the profession. The current work programme includes developing a PSG competency framework for scientists and engineers across all grades, building a 'Community of Interest', and hosting the first annual conference for the Community of Interest in January 2009. The conference will address how best to embed science and engineering advice in policy. Part of the purpose of the Community is to encourage scientists and engineers working on policy to bring their background to bear more actively on their work and thence improve policy formation and delivery.

2.5 *Departmental Agencies and Non-Departmental Public Bodies*

Many departmental agencies and non-departmental public bodies are central to providing science and engineering advice to departments. Examples include the Health Protection Agency, the Defence Science and Technology Laboratory and the Veterinary Laboratory Agency. These are tasked and resourced under arrangements with their parent departments, and relevant departmental CSAs take a close interest in their performance and contribution to policy making.

2.6 *External Advice to Departments*

Government draws on external evidence and thinking in many ways including commissioning specific projects or reviews; time limited expert panels; and through standing advisory committees. Many departments also consult widely on their research programmes and evidence strategies.

A key part of the picture are the more than 75 Scientific Advisory Committees that bring together, as appropriate, deep specialists, lay members, and a mix of analytical and other advisers (eg legal and communication) from outside Government to address specific scientific questions that confront policy makers. Some departments also have an external Science Advisory Council that meets periodically to feed expert advice and challenge into policy at a strategic level. Their composition is determined by the balance of policy needs identified by the departments involved.

2.6.1 *Scientific Advisory Committees (SACs)*

Most SACs exist to inform and challenge policy makers in a specific area. Their conduct and management are governed by the Code of Practice for SACs[2] (CoPSAC) that was revised in 2007 after public consultation following observations made by the House of Commons Science and Technology Committee. CoPSAC takes into account the *Guidelines on Scientific Analysis in Policy Making,*[3] which addresses how government departments should seek and apply scientific advice and evidence in the process of policy making.

Advice from SACs covers a wide range of issues, including helping strategic direction, horizon scanning, input to policy, conducting peer reviews, supporting regulation, certification and sharing knowledge. Depending on the needs of the parent department, SACs frame their advice to take account of technical, social, legal and stakeholder concerns. Wherever possible, SACs conduct their business transparently, publishing their deliberations. Since the new Code was launched, GO-Science has engaged with SACs to help ensure spread of good practice in areas identified by the SAC community itself. Most recently, this included a workshop on the induction of SAC Chairs (December 2008) in response to representations from existing Chairs that such guidance would improve SAC performance.

There are many good practice examples of how SA Committee advice can improve policy decisions. The Gene Therapy Advisory Committee (GTAC), sponsored by the Department of Health (DH), is a good example. GTAC is responsible for the ethical oversight of proposals to conduct clinical trials involving gene or stem cell therapies. Its advice often influences decisions made in other countries. For example, its horizon scanning report on the potential use of gene therapy *in utero* has been accepted internationally and the advice presented means that no *in utero* procedures have been performed in the UK or elsewhere in the world. GTAC advice also led to a DH commitment in the 2003 Genetics White Paper of £1 million to fund innovative gene therapy research, which combined responsive and commissioned research, and sought to enhance research capacity through genetics knowledge parks and training.

[2] *Code of Practice for Scientific Advisory Committees,* Government Office for Science, December 2007. Available at www.dius.gov.uk/publications/file42780.pdf

[3] *Guidelines on Scientific Analysis in Policy Making* www.dius.gov.uk/policy/science_guidance/documents/file9767.pdf

2.6.2 *Science Advisory Councils*

An additional model for embedding science and engineering alongside other specialist advisers is that of the Science Advisory Council. Examples can be found in MoD, Home Office, Defra, and Food Standards Agency. The underlying principle of having a senior advisory body that maps onto the policy priorities and remit of a whole department is a valuable one. Councils reflect the needs of their parent departments and can encompass physical, social and natural sciences, engineering, technology and economics. They play a key role in supporting and challenging the departmental CSA as well as the department more generally. GO-Science is working with other government departments to explore whether more Science Advisory Councils might usefully be created.

2.7 *Other Engagement and Consultation*

Part of the challenge in getting policy-makers to improve their use of science and engineering is to increase awareness and use of sources that fall outside their departments. Departmental CSAs can help with this. This challenge has also been addressed by the CST in its paper—*"How academia and government can work together"*.[4] The report concluded that there was considerable scope for further strengthening links between academia and government. Particular areas for action by a range of parties (not just Government) included building capacity, relationships and incentives.

The National Academies and Learned Societies are an important source of authoritative, impartial advice, and are often consulted by Government. In the case of the Academies this advice is rooted in their Fellowships—which bring together the UK's most eminent scientists, engineers and researchers—and ranges from responses to parliamentary committees and Government consultations through to less formal, day-to-day interactions with policy officials on a wide range of issues.

The Academies and Societies also undertake their own independent policy studies. For example:

— In September 2008, the British Academy published *Punching our Weight: the humanities and social sciences in public policy making*, prepared in concert with the Council for Science and Technology's wider investigation into how interactions between academics and public policy makers can be improved.

— In October 2008, the Royal Society launched a study looking at whether planetary scale geo-engineering schemes could play a role in preventing the worst effects of climate change. This is a particular focus for the Committee's continuing inquiry into Engineering.

Foresight projects, led by GO-Science, are good examples of work to inform policy which engage large numbers of external scientists, analysts and engineers—typically hundreds for each project, led by a small external expert group. These projects review and synthesise relevant cutting edge science and use it to undertake futures analysis relevant to policy makers. A recent example was the Obesities Foresight project which had a major impact on the Government's Obesity strategy published in early 2008, and resulted in a much more evidence-based strategy than would otherwise have been the case. The influence of Foresight is also felt internationally: for example its project on the Detection and Identification of Infectious Diseases has formed the basis for co-ordinated action by the African Union and international funding partners such as the Gates Foundation and Google. Stakeholder panels for Foresight projects typically include business, charities, regional or local bodies and NGOs, depending on the issue.

Public engagement is addressed in the last part of this memorandum.

2.8 *Maximising the Impact of the Research Base on Policy Delivery and Improved Public Services*

Research Councils have strong relationships with a large number of government departments and public bodies. Research Council funded research has had significant policy impacts, for example:

— ESRC's Centre for the Analysis of Social Exclusion contributed to the development of evidence-based policy for the Sure Start programme where Government currently spends £1,000 million per year.

— Research produced at the AHRC's Centre for Research in Intellectual Property has played a crucial role in underpinning new legislation in areas such as e-commerce, IT, biotechnology and medical ethics.

Research Council funded research has led to significant improvement in the delivery of public services, including:

— Research Council discoveries have led to better ways to treat Alzheimer's and Parkinson's diseases, diabetes and stroke.

— ESRC research led to a reform of legal liability insurance for NHS hospitals which has, in turn, improved patient safety. Offering discounts on insurance premiums to hospitals with high standards of risk management led to lower rates of MRSA infections.

[4] *How academia and government can work together*
www.cst.gov.uk/cst/reports/files/academia-government.pdf

Looking forward the impact of investment is expected to be maximised:

- All Research Councils have made the commitment to deliver a step-change in their economic impact, including impact on policy and delivery of public services, over the Comprehensive Spending Review period.
- Cross-council programmes are aimed at addressing key public policy challenges. Living with Environmental Change (LWEC) is a 10 year programme bringing together universities, research institutions, local authorities, public agencies, government departments and industry.

New Institutions, such as the Office for Strategic Co-ordination of Health Research (OSCHR) and the Energy Technologies Institute (ETI), will strengthen the links and speed up the process. These developments are underpinned by the excellence of the research base in the UK.

2.9 *Science-based innovation to improve policy and delivery*

The *Innovation Nation*[5] White Paper established a broad innovation agenda for Government which has science and research at its heart but also acknowledges the importance of the other types of innovation that go on in the private and public sectors. A key theme was to use Government procurement to increase the demand for innovative products and services—this was also a theme of Lord Sainbury's Review (*The Race to the Top*[6]). As a result of commitments in *Innovation Nation*, the Small Business Research Initiative (SBRI) has been reformed and the reformed version is being tested through pilots. Those pilots encourage innovative procurement solutions that have engaged, in partnership with the Technology Strategy Board, the MoD (maritime and energy competitions) and the Department of Health (healthcare associated infections—eg hand hygiene and pathogen detection). Participation in the reformed SBRI will shortly be widened to other departments. In addition, Government Departments have committed to producing Innovation Procurement Plans which will include procurement of research and technology demonstrators. Guidance on producing these plans was published alongside the first Annual Innovation Report in December 2008[7]

The Technology Strategy Board catalyses bringing public investment, including procurement, together with private sector investment in areas of competitive advantage for UK technology and innovation, which in most cases also address strategic or policy challenges for the UK.

The Technology Strategy Board works closely with business and regional and local bodies, as well as other stakeholders, on its strategy.

2.10 *A Department for Science*

The Government's position on this proposal was set out by John Denham, Secretary of State for Innovation, Universities and Skills, during his evidence session to the Committee on 29th October 2008.[8] John Denham said: "I think the last thing you want to do is to separate off the science and innovation bit … into a separate bit of government with no purchase on the rest of the system."

DIUS performs the role of a Department for Science, and has the added benefit of linking science and innovation with skills and higher/further education. This gives it much more weight in Government, for example in the National Economic Council, where issues around human capital, knowledge and skills can be powerfully integrated.

2.11 *The Government Office for Science*

The Government Office for Science (GO-Science) supports the GCSA in his roles of

- Providing scientific advice to the Prime Minister and members of the Cabinet;
- Advising the Prime Minister and Cabinet on aspects of policy on science and technology;
- Assuring and improving the quality and use of scientific evidence and advice in government;
- Leading the science and engineering profession in the Civil Service;
- Engaging other countries and international organisations on science and technology-related issues to help achieve UK objectives; and
- Working to strengthen the interactions between research communities and policy makers.

GO-Science is located within DIUS but is professionally independent of it.

[5] *Innovation Nation*
http://www.dius.gov.uk/publications/innovation-nation.html
[6] *The Race to the Top*
www.hm-treasury.gov.uk/sainsbury_review_index.htm
[7] Annual Innovation Report 2008
www.dius.gov.uk/policy/annual_innovation_report.html
[8] Q195 (Dr Turner)—www.publications.parliament.uk/pa/cm200708/cmselect/cmdius/c999-ii/c99902.htm

2.12 *Scrutiny of Government Science and Engineering Policy*

Science and Engineering policy is subject to scrutiny in many ways, for example by:

- The Cabinet Committee on Science and Innovation (ED(SI))
- The Council for Science and Technology
- The National Academies and Learned Societies
- Parliament, through Select Committees and other means.

Individual departments' management and use of science and engineering are scrutinised within the context of the ten year framework for science and innovation[9] both through regular self-assessment and through reviews by the GCSA. Progress on innovation in departments is tracked through the Annual Innovation Report.

3. Government Policy on Science and Engineering

The government supports the development of scientific and engineering skills through the DIUS Science and Research budget and through Higher Education Funding Councils. DIUS also promotes wider understanding and confidence in science and engineering though public engagement. The contribution that science and engineering makes to innovation and economic exploitation is supplemented by the important work of the Technology Strategy Board.

3.1 *Dual Support System*

Our world-leading universities are at the heart of the UK's Research Base. Funding of university research works through a "dual support" system—which is a combination of institution level block funding from the Higher Education Funding Bodies in the four countries of the UK, and competitive funding through the Research Councils. This dual support system balances:

- a stable (but not static) financial foundation with competitive funding for specific projects;
- the need for funders to promote specific priorities with the freedom of universities to set their own agenda;
- the rewards for discovering new knowledge with those for working with users; rewards for future potential with those for established performance.

The Prime Minister reaffirmed the Government's commitment to the dual support system when he created the Department for Innovation Universities and Skills, bringing together the two arms of the dual support system under one Secretary of State. This commitment continues.

The Government has significantly increased its investment in the research base since 1997. By the end of the current spending period, DIUS will be investing almost £6 billion a year in research, including funding for universities, other public sector research establishments and subscriptions to international scientific organisations and facilities.

3.2 *Does the Haldane Principle need updating?*

The Haldane Principle is as relevant today as ever—John Denham has restated his support for Haldane in his speech at the Royal Academy of Engineering on 29th April 2008:

> "For many years, the British government has been guided by the Haldane principle—that detailed decisions on how research money is spent are for the science community to make through the research councils.
>
> Our basis for funding research is also enshrined in the Science and Technology Act of 1965, which gives the Secretary of State power to direct the research councils—and, in practice, respects the spirit of the Haldane principle.
>
> In practice, of course, Haldane has been interpreted to a greater or lesser extent over the years, not least when Ted Heath transferred a quarter of research council funding to government departments—a move undone by Margaret Thatcher.
>
> But in the 21st century, I think three fundamental elements remain entirely valid.
>
> - That researchers are best placed to determine detailed priorities.
> - That the government's role is to set the over-arching strategy; and
> - That the research councils are 'guardians of the independence of science'.
>
> These should be the basis for Haldane today, and over the decades to come, and I am happy to re-state them.

[9] *Science and innovation investment framework 2004–14* www.hm-treasury.gov.uk/spending_sr04_science.htm

But recent debates have thrown up questions about each of those principles. How researchers determine priorities? How ministers set strategy, and how Research Councils play their vital role."

Given the strength of our research base, there are always more proposals for top class research than the nation can afford to fund. Decisions on which specific projects to fund are rightly taken by the Research Councils, using peer review, on behalf of the research community.

Ministers have an important role at a strategic level. The UK's world class research base requires major strategic and sustained investment to underpin it. For example, without ministers' involvement, research would not have been supported on a sustainable basis through full economic costing.

1. *Major facilities*

Major commitments like the UK Medical Research and Innovation Centre in Camden cannot get off the ground without active ministerial involvement across many Government Departments. The same is true of the international science and innovation centres being developed at Harwell and at Daresbury. Such commitments could be seen as constraining or pre-empting other parts of the research council programmes. But, in truth, if Britain is to be a big player in big science, major, strategic and sustained investment will always be needed.

2. *Cross cutting responsibilities*

Whilst the Government's role is to set the overarching science and research strategy, the decisions on how research money is spent are for the research community to make through the Research Councils.

Some have raised questions as to whether the Research Councils are unduly constrained by their commitments to the four cross-council programmes—on lifelong health and wellbeing, energy, living with environmental change, and global threats to security. The country faces serious challenges and it is only right for the nation to look to research to help to solve them. All of these activities are taking place against the backdrop of a growing budget.

A proper focus on these challenges is essential and it must be right that Government is able to harness scientific expertise in dealing with them. That also forms a key part of our public case for research investment.

Hence the thematic programmes give a focus and cross-disciplinary emphasis to part of the Research Councils' budget. But, within these programmes, the majority of the work funded will of course be in response mode and here too, the scope, definition and allocation of funding is determined by the Research Councils.

3. *Response to particular issues*

Occasionally cases arise where Ministers do rightly provide strategic direction, whilst still not becoming involved in individual decisions. When the Government accepted the scientific advice not to proceed with the fourth generation light sources, it raised questions about the future development of Daresbury—an important science and innovation priority. Therefore Sir Tom McKillop was asked to extend his work with the North West Development Agency, to advise on its future development. DIUS worked with STFC to ensure he has the scope to do so.

Similarly when it became clear how the STFC priorities might affect two areas of physics, the Secretary of State initiated a process that led to Professor Wakeham being asked to review the health of the discipline. The Wakeham review has been published and RCUK are working to implement the recommendations.

3.3 *Regional Science Policy*

In responding to the IUSS Select Committee on the Science Budget Allocations (published 30 April 2008) the Government made clear its position on regional science policy:

"The Government is committed to excellent science and research, wherever this may be in the United Kingdom. Research Councils will fund the very best research and facilities, wherever they are located in this country. This fits entirely with the Haldane Principle as set out at paragraph 3.2 above. The Government does not plan to publish a white paper on regional research policy. The ten year framework[10] provided a clear statement on Government policy in this area:

'Public funding of research at a national level, through the Research Councils and funding bodies, is dedicated to supporting excellent research, irrespective of its UK location. The 'excellence principle' is fundamental to safeguarding the international standing and scientific credibility of the UK science and research and supporting an excellent, diverse, expanding and dynamic science base, providing value for money for public investment.' (9.52 p 146, Science and Innovation Investment Framework 2004–2014)

This policy remains firmly in place."

[10] Science and Innovation Investment Framework 2004–2014, HM Treasury, July 2004. http://www.hm-treasury.gov.uk/spending_review/spend_sr04/associated_documents/spending_sr04_science.cfm

John Denham in his speech at the Royal Academy of Engineering on 29th April 2008 restated the Government's commitment to Haldane and outlined why it is necessary for Ministers to get involved in large strategic decisions:

3.4 *Allocation of the Science Budget*

Allocation of the science budget is underpinned by a body of evidence including draft delivery plans from each Research Council.

The DIUS Director General of Science and Research (DGSR) has committed to wider consultation in the run up to the next Spending Review. As a starting point, any consulting will satisfy the following principles:

- Consultation will be wide-ranging and visible to ensure it is of high quality and has the confidence of the community
- Consultation will not be at the disciplinary level

The DGSR has asked the following bodies to provide formal advice:

- The Royal Society
- The Royal Academy of Engineering
- The British Academy
- The Council for Science and Technology
- The Chief Scientific Advisers Committee
- The Confederation for British Industry

The process of consultation would involve the following steps:

- Early in the process, the DGSR would attend a Council meeting of each of the above bodies for a discussion around the core issues.
- Each of the above bodies would publicly submit advice to the DGSR at two stages in the process:
  - Before the departmental submission is sent to Treasury
  - After the departmental allocation is received from Treasury but before the allocations to each Research Council are made

At least twice during the process the DGSR will chair a meeting of the Chairs/Presidents of each of the above bodies to discuss the advice given in plenary.

3.4.1 *Research Base Funders Forum*

The Research Base Funders Forum was set up to allow governmental and non-governmental funders of public good research to consider the collective impact of their strategies on the sustainability, health and outputs of the Research Base. The Forum meets quarterly and is chaired by DIUS's Director General Science and Research. Its members come from charities, industry, Research Councils, Funding Councils, Regional Development Agencies, the Higher Education sector and government departments.

3.5 *Reporting Progress on the 10 Year Framework*

The Science and Innovation Investment Framework (SIIF) Annual Report provides a regular update on Government progress against the six main aspirations of the original document to :-

- increase the global competitiveness of UK research and its sustainability;
- increase knowledge transfer from universities and research institutes;
- increase business investment and engagement with the science base;
- retain a strong supply of scientists, technologists and engineers;
- build understanding and improve public attitudes to science;
- ensure Government uses the highest quality science and scientific advice.

As a framework document it provides scope for change and development in policy to achieve the Government's long term vision for UK science and innovation. For example, since 2004, the Government has published the Innovation White Paper (*Innovation Nation,* March 2008) and last month published the first Annual Innovation Report. The 2008 SIIF Annual Report is available at www.dius.gov.uk/policy/annual_innovation_report.html

3.6 *Supporting Public Engagement*

Science and engineering improve the quality of daily life, underpin prosperity and increase our readiness to face the challenges of the future, both in the UK and globally. The potential for science and engineering to contribute to good policy making and sound government has never been greater. Our ability to meet the challenges depends on our ability to handle the science and engineering involved, by accessing sound scientific advice, and by engaging with the public.

Having an engaged public means recognising that science and engineering is not just a body of facts, but a discipline with established methods of inquiry, peer-review and governance. It means understanding that science and engineering is often about measuring uncertainty and allowing ordinary people to better challenge what they read about and understand different forms of scientific evidence.

The ten-year Science and Innovation Investment Framework 2004–2014 and its subsequent annual reports highlighted the importance that the Government attaches to greater public confidence and improved engagement in scientific research and its innovative applications. The ten-year framework set an objective to:

> "demonstrate improvement against a variety of measures, such as trends in public attitudes, public confidence, media coverage, and acknowledgements and responsiveness to public concerns by policy-makers and scientists".

In 2008 DIUS began a wide-ranging consultation on a future UK strategy for the relationship between science and society. The consultation covers topics around the themes of public engagement in science, development of a representative STEM workforce and greater confidence in both public and private sector use of science. Following the consultation, which closed in October 2008, a long-term strategy will be developed with an implementation plan for publication in early 2009. The consultation document suggested that there is a pressing need to do two things:

- strengthen the level of high quality engagement with the public on all major issues; and
- increase the number of people who study scientific subjects and work in research and scientific careers.

The Government's public engagement with science programme continues to provide a lead in encouraging open, constructive and informed debate on the social, ethical, health, safety and environmental implications of new and emerging science and technologies. Key achievements in the last year on building engagement and improving public attitudes to science, include:

- the launch of a wide-ranging consultation to develop a UK strategy for Science and Society;
- publication of the results of the third Public Attitudes to Science survey;
- launch of the Sciencewise Expert Resource Centre for Public Dialogue in Science and Technology in response to the Council for Science and Technology's recommendation to create a corporate memory of engagement practice;
- increase in the National Science and Engineering Week's media impact and development of an expanded UK Young Scientists' and Engineers' Fair with a National Science Competition element;

As part of a long term initiative to raise public interest and commitment to science (involving a broad range of stakeholders including Government, media and business) Lord Drayson will launch the 'Science … So What?' PR campaign in January 2009. The aim of this campaign is to make a concerted effort (drawing on good news stories from Research Councils, universities, academies and other bodies) to increase the visibility of UK science and the benefits it brings to society and the economy. A key part of this approach is to involve Science champions that have broad public appeal (from a popular rather than scientific base). The campaign will integrate with other campaign activities during 2009 such as Darwin 2009, and National Science and Engineering Week.

January 2008

Annex 1

EXTRACT FROM JOHN DENHAM'S SPEECH TO THE ROYAL ACADEMY OF ENGINEERING, LONDON—29 APRIL 2008

"*For many years, the British government has been guided by the Haldane principle—that detailed decisions on how research money is spent are for the science community to make through the research councils.*

Our basis for funding research is also enshrined in the Science and Technology Act of 1965, which gives the Secretary of State power to direct the research councils—and, in practice, respects the spirit of the Haldane principle.

But in the 21st century, I think three fundamental elements remain entirely valid.

— *That researchers are best placed to determine detailed priorities.*

— *That the government's role is to set the over-arching strategy; and*

— *That the research councils are 'guardians of the independence of science'.*

These should be the basis for Haldane today, and over the decades to come, and I am happy to re-state them."

Memorandum 2

Submission from Unite the Union

This response is submitted by Unite the Union. Unite is the UK's largest trade union with 2 million members across the private and public sectors. The union's members work in a range of industries including manufacturing, financial services, print, media, construction, transport and local government, education, health and not for profit sectors.

Executive Summary

— The potential growth of the UK manufacturing sector is predicated on a thriving and successful science and engineering research base.

— The future funding and investment in research centres and higher education institutions by government is vital to UK manufacturing innovation and research and development.

— Science and engineering policy must be viewed holistically, from education policy through to the successful financial exploitation of goods and services researched, designed and produced in the UK by UK workers.

— There is enormous potential in the purchasing power of government public procurement to stimulate innovation in its suppliers and manufacturing excellence and efficiency in the UK.

— Government must re-evaluate its *laissez-faire* attitude to UK manufacturing and its contribution to the UK economy by appointing an effective Minister for Manufacturing.

— Unite believes the creation of a Department for Science is a crucial step forward, especially as Lord Drayson is now the Minister for Science.

— There is overwhelming evidence that a national strategy for the teaching of science, technology, engineering and mathematics (STEM) subjects is required.

— Unite is clear that there needs to be a rigorous marketing campaign to encourage teachers and careers advisors to raise the profile of studying science and engineering and the career options available.

— The Haldane principle is fine in principle but the 25% claw back by government must be targeted at forwarding science and engineering research in the UK and ensuring there is a balance between academic institutions, the needs of UK industry and the wider international community.

— To ensure there is a growth in the development of new and innovative products and services in the Space sector, government must create a climate conducive to all stakeholders involved in the sector.

1. Introduction

1.1 Unite welcomes the opportunity to respond to this consultation. Unite represents thousands of members who work within a large number of industrial sectors that rely heavily on innovation and scientific research and development. These workers are crucial to manufacturing industry across the globe and it is the retention and promotion of UK scientists and engineers that is of vital importance to many of the most dynamic and progressive companies in the UK.

1.2 Unite works extensively with employers across the manufacturing sector and a large number of them have consistently expressed concern about the systematic changes within science and engineering teaching, the quality of higher education provision, the loss of Physics grants across the UK and the "knock-on" effect these have on the wider manufacturing sector and ultimately the UK economy.

1.3 Government ignores at its peril the innovation and R&D requirements of new growth industries such as climate change objectives, research into new forms of energy, research which can be transferred into environmentally friendly products and services, the sheer growth of onward technological change required in the defence industry with the wars in Afghanistan and Iraq, Space innovation and how the world will feed itself in the future.

1.4 It is clear that the potential for growth in the UK manufacturing sector is huge, but this growth is predicated on the science and engineering research base being well funded and important research centres being sufficiently resourced. To this end Unite believes that science and engineering policy cannot be seen in isolation but must be viewed holistically from education policy right through to the successful financial exploitation of products researched and designed in the UK by scientists and engineers working in the UK.

1.5 Unite believes there is immense potential in using the enormous purchasing power of government public procurement to stimulate innovation amongst its suppliers. Procurement could be used to favour the brightest and best ideas in industry and assist in stimulating manufacturing excellence and efficiency in the UK.

2. Department for Science

2.1 Unite has consistently expressed concern that the present government does not take manufacturing seriously and has done little and achieved less in focussing on the role and contribution that manufacturing has to offer the UK economy.

2.2 Unite believes that a Department for Science would be a step in the right direction; especially as Lord Drayson is now the Minster for Science, and could contribute greatly to a focus and strategic overview that is currently lacking. Unite would like to see a consistent, pragmatic approach to science and engineering policy in the UK. Unite has noted that too many Ministerial changes, the imposition of new education policies, the cuts in science funding coupled with the lack of a committed Minister for manufacturing has created a situation where UK industry is consistently falling behind in the global market.

2.3 The EU Lisbon Strategy which calls for a high value, highly skilled workforce is predicated on the production of a high number of highly educated, highly skilled workers being produced consistently in the UK. UK expenditure on research and development is currently 1.73% of GDP[11] which means the target of achieving R&D intensity of 3% of GDP for the whole of the European Union by 2010 is clearly unachievable and UK government and business must work together to improve this situation.

3. Education and training

3.1 Unite believes there should be a national strategy for the teaching of science, technology, engineering and mathematics (STEM) subjects which needs to have a clear focus and objective and also to be free of over burdening bureaucratic involvement. The UK government has introduced a huge number of new education initiatives, which have yet to bed down and produce systematic positive results.

3.2 There also needs to be a clear delineation in the statistics around STEM subject degree qualifiers, how many are from UK students and how many from students from abroad but studying in the UK. The proportion of foreign PhD students is second only to the USA and this is especially true of engineering; 51% of engineering doctoral degrees from UK universities are awarded to overseas students.[12]

3.3 It is vital that new educational structures and further education training schemes are accountable and transparent. Unite works extensively with employers to ensure there is significant work place training for workers and in this way everyone can enjoy the benefits of a life-long learning agenda that in turn benefits UK business and the UK economy.

3.4 Unite has expressed serious concerns about the decline in the number of entrants to STEM subject A levels. This really does need to be addressed and it is vital that young people and their parents receive the correct information to allow them to make the right choices when choosing their subject choices. Unite also believes that the suggestion to increase the UCAS points value for STEM subjects could increase the value of these subjects to students and encourage more young people to opt for those subjects.

3.5 Teachers and careers advisors are in a position to highlight the benefits and the broad career choices that are available from studying science and engineering. It is clear that government policy which is forcing the closure of physics department across the UK must be addressed. Cutting grants at a time when government is saying that "a high value, highly skilled workforce is the key to wealth creation in the future",[13] is madness. There should be no further cuts in research grants to universities and Unite would want to see an increase to at least previous levels of funding for science and engineering.

[11] Science, technology and innovation in Europe, *Eurostat Pocket Book* 2008 edition.
[12] *Internationalisation of R&D in the UK: a review of the evidence,* Arthur D. Little with Prof Reinhilde Veugelers, November 2005.
[13] Prime Minister, the Rt Hon Gordon Brown MP.

4. Haldane principle

4.1 Unite believes that the Research Councils do an excellent job of supporting the balance required between industry and academia. The present set up where 25% of the funding for Research Councils is clawed back by government for specific research targets is fine as long as government uses the funding to forward science and engineering in the UK and works closely with industry to ensure research projects selected are strategic, pragmatic and innovative.

4.2 Unite would also like to see a specific link between certain research institutions and industry. In this way Unite believes that a greater balance will be achieved in ensuring that research undertaken by academic institutions is not purely done for the financial rewards but is balanced by the needs of UK industry and the wider international community.

4.3 Unite is clear that there should be a national science and engineering policy. There is scope for regional initiatives which could chime with key research work being undertaken by research institutions that may also be linked to local companies. Unite also recognises that the UK needs to be centre stage of any science or Space policy in Europe. The UK cannot afford to devolve satellite services and Space policy purely to Europe but it is imperative that the UK government when formulating policy does not work in isolation of what is happening in Europe and in the wider international community.

5. Space

5.1 The UK Space sector currently contributes around £7 billion to the UK economy.[14] Space is an excellent example of a sector that is providing world class research in astronomy, solar physics and planetary science, but suffers from haphazard policy decisions and a lack of commitment by government for strategic investment.

5.2 The sector has also achieved scientific excellence in Earth science, understanding climate change and world-class environment forecasting. This will not continue unless government commits fundamentally to the long term financial investment that is needed for a "blue-sky" sector.

5.3 To ensure the development of new and innovative products and services, to increase the UK share of this growing international sector, government must create a climate where science and engineering policy encourages young people to study science and engineering and also brings together research institutions and industry to develop products and services that benefit the wider international community and the UK economy.

Unite Recommendations

- Government must acknowledge the importance of manufacturing to the UK economy and appoint an effective Minister for Manufacturing.
- Government must ensure the relevant Research Councils are sufficiently funded to ensure that science and engineering receive the high profile they require and the consistent investment they need.
- Unite believes science and engineering policy should be viewed holistically, from education and training policy through to the successful exploitation of products and services.
- Unite believes government should be encouraging the use of public procurement to stimulate innovation amongst its suppliers.
- Unite believes research and development and launch aid investment should be linked and used to create and sustain manufacturing jobs in the UK.
- Unite believes there should be a Department for Science and this should include engineering and innovation.
- Unite believes government still has substantial work to do to achieve the goals set out in the EU Lisbon strategy for a high value, highly skilled workforce.
- Unite believes the trade union movement should have a substantial role in the development of skills and training within the workplace and a training levy should be introduced if employers consistently refuse to train their workers.
- Unite believes there should be a national strategy for the teaching and development of STEM subjects in the UK.

[14] UK Civil Space Strategy 2008–2012 and beyond.

— Unite believes the profile of manufacturing and the career opportunities it offers needs to be developed and improved.

— Unite believes there should be a national science and engineering policy with scope for regional initiatives and opportunities.

January 2009

Memorandum 3

Submission from Prospect

INTRODUCTION

1. Prospect is a trade union representing 102,000 scientific, technical, managerial and specialist staff in the Civil Service and related bodies and major companies.
Our members are professionals, managers and specialists across a diverse range of areas, including agriculture, defence, energy, environment, heritage, justice and transport. Prospect represents more professional engineers than any other UK union. Across government we represent 18,000 engineers, scientists and technical staff.

2. We welcome the opportunity to submit evidence to this inquiry because, despite strong investment by the Government in the science budget and the high profile given to science and engineering through the Treasury's ten-year investment framework, we are concerned that science for the national good is under threat. In recent years, world-leading UK programmes including research into breast cancer, agri-engineering and animal diseases have been closed. Research on the impacts of climate change, pollution and biodiversity all struggle for funding. The UK's industrial research base has been decimated. Ninety-seven sites have been closed, sold or contracted out over the last 20 years. In Prospect's view there needs to be diversity in the organizations that perform such work—government laboratories, universities, charity and business—so that no discipline is only supported by one type of organization. The "contract research" model is not likely to be sustainable because the contractors are not driven to identify and pursue winning ideas.

3. Whilst Prospect accepts that priorities can and do change, we object to the fact that such devastating decisions have been taken with no central knowledge by government of the location, functions or specialist expertise it employs—and hence no clarity of what capability is being lost or whether retained capability will be sufficient to cope with future demands. A significant example of failure to maintain national technical capacity is in the nuclear industry. For example, UKAEA used to run a number of internationally recognised centres of expertise, but this was curtailed at the time of the 1996 privatisation. Expertise and documentary records have been irrevocably lost and the current position is that no UK organisation has the capacity to offer a candidate design for the next generation of nuclear power stations.

4. This submission builds on our earlier evidence to the Select Committee's inquiry into *"Engineering"*.[15] It also draws on Prospect's contribution to the TUC's evidence to the consultation by the Department of Innovation, Universities, Science and Skills into *"A Vision for Science and Society"*[16] and on Prospect's own evidence to the inquiry by the Public Administration Select Committee into *"Good Government"*.[17] Our response to the specific issues identified by the Select Committee is set out in the following paragraphs.

Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science

5. In 2006 Prospect published a Charter for Public Science identifying, among other objectives, the need for a clear strategic vision for UK science and a Cabinet Minister with authority and accountability for public sector science—with a similar Ministerial role in the devolved administrations. We therefore very much welcome the Government's decision to establish a Cabinet Sub-Committee on Science and Innovation and we welcome the fact that the Science Minister, Lord Drayson, attends Cabinet meetings. However, more could be done immediately to make sure that Lord Drayson's Cabinet level role includes cross-cutting accountability for public science and is not simply to act as an exponent of science in Cabinet, important though that is.

6. Prospect believes that science and technology have a crucial role to play in identifying high quality and sustainable investment opportunities that would help to lead the economy out of recession. However, the same commitment must extend to funding for blue-skies work and pure research and development, which must come from an adequately funded and motivated public sector science base. Public science must provide a measure of stability to preserve the UK's technical capacity through short-term fluctuations in demand.

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[15] *"Engineering"* (March 2008) and *"Engineering in Government"* (October 2008).
[16] *"A Vision for Science and Society"*—TUC (October 2008)
[17] *"Good Government"* (October 2008).

As yet we are unable to judge—because we have not seen the evidence—whether the Cabinet Sub-Committee has succeeded in putting science and engineering at the heart of policy-making. We hope that it will do so. We certainly believe that, short of establishing a separate Department for Science, this is the best opportunity to make science and engineering integral to high-level policy-making.

7. Prospect does accept that the Government is trying to improve coherence and coordination between the centre and individual departments. However there is a deeply embedded culture in the civil service of departments, headed by competitive Permanent Secretaries, guarding their own territory. There is no doubt that this creates real difficulties for effective implementation of policy areas with cross-government application, such as science and innovation. There are dangers either of lack of effective stewardship or policy paralysis, where Departmental Ministers with differing priorities effectively veto decision-making. There are also challenges in resolving tensions between the desire for central co-ordination on some issues whilst delegating responsibility on others.

How Government formulates science and engineering policy (strengths and weaknesses of the current system)

8. In Prospect's view, and in line with the Fulton principles, good policy-making should also be based on objectivity and impartiality and on Ministerial accountability through Parliament. It is also crucial in relation to science and engineering policy to have "intelligent" or informed customers within government to undertake a range of roles including identifying whether research needs to be carried out, having knowledge of capabilities to undertake necessary work, assessing the merits of alternative contractors, and evaluating the end results. This range of expertise is unlikely to be found in one person and the function needs to be properly resourced. Furthermore it can only be achieved if a close relationship is retained between those responsible for policy and its execution.

9. Yet Prospect members directly involved are concerned that, in part due to recruitment difficulties, government's capacity as an "intelligent customer" of engineering projects has eroded. There is insufficient technical expertise both among Senior Civil Service policy and decision makers and at levels below Chief Scientific Adviser, resulting in increased use of external consultants without either contextual knowledge or "corporate memory".

10. Members do report examples where engineering advice feeds effectively through to policy makers, though often this is through informal means and dependent upon personal relationships with colleagues in policy teams. In effect, engineering advice is "loaned out" through the goodwill of individual engineers and their managers. Whilst this can work well, the informality of such arrangements means that consultation does not occur as a matter of course and so there are likely to be many instances where policy decisions are made without engineering input. Too often engineering and scientific advice are called on simply in times of crisis and, on occasion, to rectify poor quality work done by external consultants.

11. By contrast, there are examples of good government in operation. Examples include the Seed Potato Classification Scheme (SPCS) and the Plant Health Propagation Scheme (PHPS) run by the Plant Health and Seed Inspectorate in DEFRA. In both cases European Union and international directives are put into effective operation by competent technical officials working in close collaboration with the industry and with scientists to ensure a scheme that is practical, fair and effective in the interests of industry and the public.

Whether the views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is assessed

12. As outlined above, Prospect would agree that the science and engineering community should have an effective voice in the formulation of government policy. Of course, ultimately it is Ministers that are accountable for decisions but Prospect believes that more could certainly be done to make the process of decision-making more open and to consult with the wider community at a sufficiently early stage to allow for the possibility of influencing outcomes. For example Prospect has painful experience of being consulted on how to deal with the consequences of research closures or transfers rather than having the opportunity to provide evidence or put forward arguments that could lead to a different decision.

13. Many Prospect members are also members of professional scientific and engineering bodies, and Prospect seeks to work collaboratively with such bodies on projects of common interest. For example, we have worked with the Institute of Physics on research funding issues and sponsored events by the Institution of Engineering and Technology—including in support of smart metering. More broadly, Prospect is involved with initiatives such as Women into Science, Engineering and Construction (WISE) and the UK Resource Centre for Women in Science, Engineering and Technology (UKRC), which provide valuable expertise and resources to enhance diversity.

14. However, we believe that the Government also has a cross-cutting responsibility to ensure the nation's future science and engineering capability. There are currently pressing challenges to ensure an adequate skills base for the future, as highlighted in recent work both by the then Department for Business, Enterprise and Regulatory Reform[18] and the Department for Environment, Food and Rural Affairs (Defra).[19] Sector

[18] Energy Skills—Opportunity and Challenge.
[19] Skills for a Low Carbon Resource Efficient Economy.

Skills Councils are starting to address these challenges, albeit with varying degrees of success in business environments that tend to be dominated by short-term concerns. In Prospect's view, the Commission for Employment and Skills could play a valuable role in taking this work forward.

The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating

15. Prospect accepts that the debate over regional science policy is highly charged. Our overriding objective is to ensure excellent science throughout the UK. However Prospect members outside the South East have been at the sharp end of policy-decisions that have had harsh consequences for their work despite its recognised excellence. More broadly we share the concerns expressed by the TUC and Universities UK regarding the structuring of research funds which could concentrate funding into the largest and most highly rated university units thus exacerbating existing regional differences in research capacity and performance. If that were to happen most regions have research areas at risk as would clusters in engineering, physical sciences, social sciences, medicine and environment. It should also be noted that some disciplines are enhanced by having a dispersed set of research facilities, for example research into the natural environment.

16. Although there seems to be little overt Ministerial support for a regional science policy, we are conscious that the Government is concerned about future regional economic prospects. Following on the Manchester Independent Economic Review, being led by Sir Tom McKillop, the new Regional Economic Council must surely also have keen interest in regional science and engineering capability as a basis for addressing recessionary pressures. We would therefore urge that the Government uses this mechanism to ensure that it builds on and provide support for regional science and engineering capability as a cornerstone of new industrial policy. Ensuring the future skills base will be integral to this approach.

17. Whilst we recognise the longevity and enduring value of the Haldane principles, we do now think that the time is right for them to be updated. For example, there is a compelling case that earlier engagement by the Director General of Research Councils in some recent decisions could have widened the criteria under consideration, promoted greater openness, and resulted in improved quality of outcomes. It no longer makes sense, in a global research environment, for government to be at arms' length from decisions that will impact on UK capability. Neither does it make sense for decisions that may be of wider consequence to be entirely devolved to individual organisations or funding bodies. In practice, decision makers generally occupy multiple roles and responsibilities. The Government should accept that this is the case and ensure that it can also exercise strategic influence without infringing Haldane.

Engaging the public and increasing public confidence in science and engineering policy

18. Prospect welcomed the Government's consultation on "A Vision for Science and Society". It is important for many reasons both to engage the public and to increase public confidence in science and engineering policy. Too often there is a disconnect between individual interaction with science and technology applications and awareness and understanding of the underlying science and engineering. Further, past attempts to engage and build confidence have not always been successful and it is important to learn from experience, for example of the GM Nation debate. Equally government must resist the temptation to treat its own scientists either as infallible oracles or scapegoats for unpopular political decisions. The most recent Foot and Mouth Disease (FMD) outbreak showed that the public did have a high degree of trust in the Government's Chief Veterinary Officer at that time, but were much less confident about statements made by Ministers.

19. As the TUC's response to the consultation on "A Vision for Science and Society" pointed out, an ongoing dialogue will also make it much easier for the public to understand and engage with changing scientific priorities. Of course, there can be no public veto over individual scientific projects. We must continue to rely on experts to advise on the science that is most beneficial, in both applied science and fundamental research. But that does not mean that the public has no interest or that both science and society cannot benefit from greater dialogue.

20. However, a successful process of engagement should involve more than dialogue with individual citizens. Hundreds of thousands of trade union members work in science and engineering based employment, and they should have the opportunity to have their voice heard through their union. This often does not happen at the moment. For example, the 2007 TUC Congress carried two resolutions highlighting important issues on which there has been little, if any, debate with the relevant unions.[20] The first, moved by the Society of Radiographers, addressed the need for realistic and enforceable control of genetic testing rather than employers and insurance companies relying on self-regulation, which has the potential for misuse and discrimination in the workplace and in the wider community. The second resolution, moved by the National Association of Schoolmasters/Union of Women Teachers, noted that, whilst developments in technology have improved working practices, technologies such as mobile phones, e-mails and internet sites can be used to bully and harass workers, undermining their health, well-being, confidence, self-esteem and, in some cases, their career progression.

[20] Discussed in TUC policy document *"Hybrid Cars and Shooting Stars"* (2008).

The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy

21. Prospect believes that the Government Office for Science has an important and significant role to play, though it is not well resourced to deal with a complex and wide-ranging engineering community. The initiative by the new Chief Scientific Adviser to establish a science and engineering community of interest is very welcome but, in practice, its impact will be limited because it depends on voluntary self-identification and is limited to core government departments and agencies. Prospect played an active role in promoting this initiative to our members, many of whom had not heard of it from their own employer. Others who wished to become involved were barred from doing so because they work outside the core civil service, despite the fact that this is where much of the government's practical engineering work is undertaken. In our view the initiative should be extended to include the whole Government science community.

22. At departmental level Chief Scientific Advisers and Heads of Science and Engineering Profession tend to be even less well resourced, and many combine this responsibility with other professional roles. Prospect did have high hopes that Government Skills, the Sector Skills Council for central government, would provide additional support to the network of scientific advisers. However, it is becoming increasingly evident that Government Skills' priorities lie elsewhere. This is of particular concern given that many of the key challenges for government, such as climate change and defence security, depend crucially on engineering and technical expertise.

23. Prospect remains concerned that although the Government has consistently supported the science base through the Science Budget, this commitment is not always replicated in departments—particularly when their own budgets come under pressure. For example, the level of core funding for research institutes leaves many of them highly vulnerable to shifts and reductions in competitive funding that owe more to short-term changes in departmental priorities than to the quality of work being undertaken. Such decisions can have significant implications for regional capability, and we would certainly hope that the Government will use its new Regional Economic Council to ensure that decision-makers are better sighted on the regional dimensions of science and engineering policy.

24. In similar vein, the announcement in the Pre Budget Report to once again review the ownership status of key science bodies, such as the Met Office, appears to be wholly cost-driven. As well as providing the National Meteorological Service for the UK, its combined weather and climate change research and expertise is relied on by the Ministry of Defence (MOD), the Department of Energy and Climate Change and Defra. Privatisation would denude the Government of this intelligence and impoverish the UK's contribution to the Intergovernmental Panel on Climate Change. Prospect finds it incredible that the Government is considering proceeding with privatisation given that numerous previous investigations have concluded that the Met Office should be left as a public service, and at a time when the general economic climate will fail to provide an adequate return.

How government science and engineering policy should be scrutinised

25. Over the past five years much effort has been devoted to various reviews of the governance of Public Sector Research Establishments (PSREs) in order to attempt to ensure that they remain fit for purpose in a changing world. In many cases the status quo has often been confirmed as the optimum governance model and it is far from clear whether the time, cost and effort of the reviews has delivered any tangible benefit to wider society. Indeed, in a small number of cases the governance changes that have been implemented have arguably weakened the organisation and thereby the ability of Government to access impartial, evidence-based advice on nationally important issues.

26. Whilst Prospect recognises the need to regularly review the governance of public sector science and engineering to ensure that it meets society's needs, it is our experience that the current process actually weakens the science and engineering base rather than strengthening it. We therefore recommend that there needs to be a period of stability before conducting any future reviews, which then should be of a light touch in nature. This, we believe, would allow organisations to consolidate and plan for a sustainable future and to attract, motivate and develop science, engineering and technology professionals.

December 2008

Memorandum 4

Submission from the Natural History Museum

1. The Natural History Museum (NHM) maintains and develops its collections and uses them to promote the discovery, understanding, responsible use and enjoyment of the natural world. Our science explores the diversity of the natural world and the processes that generate such diversity. NHM is one of the world's leading institutions for systematics and taxonomy: these are areas of science that are intrinsic to the scientific understanding, monitoring and conservation of biodiversity.

2. The expertise of 350 NHM scientists and its natural history collection of 70 million items are the basis for international integrated research on the natural world; provision of collections access to many scientists; development; provision of information resources; and education and public engagement. Its broad role as a museum is inseparable from its science: it enables the NHM to take innovative approaches to public engagement in science and the natural world. It combines skills and pursues collaboration to meet constantly changing needs in many countries.

3. NHM research is centred on taxonomy and related disciplines. It describes what organisms exist and how they interact; where they are; and how diversity changes and develops. This work integrates taxonomy with other areas of research. Our research framework[21] summarises the wider scientific questions to which taxonomy contributes in the Museum and through collaboration: these include biodiversity conservation and loss.

4. The Museum's work enables natural diversity to be described and understood. Research and monitoring for biodiversity, ecosystem services and climate change relies on taxonomy in investigating diversity, monitoring changes, and modelling vulnerability; policy-makers need information that is underpinned by taxonomy; capacity building and training involve taxonomic expertise; public initiatives and engagement routinely involve taxonomy.

5. The Museum has recently made a submission to the inquiry of the House of Lords Select Committee on Science and Technology on the state of systematics and taxonomy research: the subject of the House of Lords inquiry is relevant to some of the concerns of the present inquiry.

6. We welcome the opportunity to provide this submission to this inquiry and endorse the need for a wider discussion on the issues it raises.

1. *Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science?*

7. We support the government's ambitions for embedding evidence-based policy-making and raising scientific considerations across the policy spectrum through the Chief Scientific Advisers network. The Cabinet Sub-Committee and the CST provide potential for appropriate involvement of Ministers and senior scientists from outside government.

8. CST appears to have a relatively low level of activity, albeit on important topics and there would be benefit in defining its role as part of a spectrum of bodies offering analysis and advice both inside government and beyond.

9. Science is not isolated from society or government policy, so it is vital that it is embedded across all departments. However, there is value in a specialist enabling focus for science policy.

2. *How Government formulates science and engineering policy (strengths and weaknesses of the current system)?*

10. We support the government's ambitions for wider consultation in policy-making, especially with the public.

11. The need to demonstrate public value by publicly-funded organisations is critical in order to build trust and ownership of the public realm. Engaging the public in science policy-making should make policy more successful. We would encourage policy makers to recognise the value of the public's knowledge and value the process, as well as the results of engagement. Support for longitudinal research to explore the actual outcomes of prolonged public engagement in individuals and sectors of society would be of use.

12. We would encourage the creation of citizen panels for consultation and measurement purposes, as well as to make individual science research institutions more transparent in order to build public confidence in science.

3. *Whether the views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is assessed?*

13. We believe that the science and engineering community is in fact an overarching grouping consisting of a number of communities and that this reference is does not acknowledge this. Some operate coherently as networks of expertise and interest while others do not: their capacity to engage on policy differs accordingly. This coherence is not necessarily aligned with the importance of policy development. Policy-makers must acknowledge this in their thinking.

[21] http://www.nhm.ac.uk/research-curation/science-directorate/science-policies-strategy/assets/researchframework.pdf

14. We believe that the science and engineering community should contribute to the formulation of government policy and be explicitly involved, but not necessarily as the only stakeholder.

15. Science should be an element in all government policy-making and there should be greater awareness across government of how policy impacts the science and engineering community.

4. *The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating?*

16. We recognise the importance of the Haldane principle and this should remain an essential element in maintaining the international competitiveness of the UK in science. The partial shift of research funds to direct government administration since 1971 is important in tying research to policy, but constant efforts must be made to ensure that government is able to make good decisions on policy-related funding. This can only be achieved by involvement of scientists as civil servants or expert advisers.

17. Science is an international activity and therefore requires national policy to ensure the UK remains competitive and develops critical mass. However, we do believe that a regional focus would be useful for technology transfer and public understanding of science.

5. *Engaging the public and increasing public confidence in science and engineering policy?*

18. We believe that increasing public participation in science and raising scientific literacy levels is vital to society and to ensure the UK economy remains competitive.

19. The Natural History Museum is uniquely placed as a world-class science research institute and cultural visitor attraction where we engage our visitors with our scientists to create a better understanding of scientific issues, how science works and to encourage more students to study science and view science as an attractive career option. The Museum acts as a catalyst for a wider network of public engagement with science.

20. There is a wealth of expertise in science communication in a number of established venues and a wider recognition of the value of public engagement with science. The Museum aims to attract more large and diverse audiences, and free admission has assisted in increasing our visitor numbers. We offer creative and innovative galleries and science education programmes that aim to stimulate interest in how science works and recognition of the value of science. We have experience of engaging with difficult to reach groups by making science accessible through specific cultural contexts.

21. The need to work with the media is obviously important to combat the public's and media's mistrust of science and in order to generate a greater interest and understanding in scientific issues.

22. There is a need for greater cross-sector working to achieve national and European science and society objectives. We endorse the Government's support for national public engagement campaigns, like Darwin200.

23. We would encourage policy makers to use trusted intermediaries, like the Natural History Museum, for facilitating greater dialogue between policy-makers, scientists and society. People already visit places like the Museum and we are equipped with specialised skills and spaces for this type of engagement.

6. *The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy?*

24. All the stakeholders mentioned should be able to explicitly contribute to science and engineering policy. Policy-making needs to recognise the diversity of these stakeholders who are funders or consumers of science, or a mixture of both.

7. *How government science and engineering policy should be scrutinised?*

25. We believe that both the House of Commons Innovation, Universities, Science and Skills Committee and the House of Lords Science and Technology Committee play a crucial role in scrutinising the government's science and engineering policy.

26. Scientific advice to government and the government's total expenditure on research should be more transparent and open, to a certain degree to wider public scrutiny, both directly and through the aforementioned Parliamentary Committees.

December 2008

Memorandum 5

Submission by the Royal Aeronautical Society

Summary

— Science and especially scientific methodology should be at the heart of evidence-based policy-making. However, scientific propositions, particularly when they inform commitments of large amounts of public money must be subject to rigorous peer review.

— This must also extend to private agencies in receipt of public funding or investment.

— The confidential nature of some areas of public policy may still preclude extensive reference to external bodies, but the assumptions and rationale of science-based programmes must be subject to adequate scrutiny.

— Given the subtle but important differences between scientific and engineering disciplines, the government should have direct access to engineering-based advice.

— The Society recommends a dialogue between the government and the engineering community to establish how applied technological and engineering issues might be afforded more emphasis in the work of the Government Chief Scientific Adviser and his Departmental colleagues

— The development of scientific and technological capabilities in the UK regions is an important factor in the promotion of regional economic activity; but given the limitations on national resources, such investments must also make sense nationally.

Introduction

1. The Royal Aeronautical Society (RAeS) is the Learned Society for the Aerospace community. Based in London, it has a world-wide membership of over 17,000, with over 13,000 in the UK. Its Fellows and Members represent all levels of the aeronautical community both active and retired. Through its various Divisions, Branches, Boards and Committees, it can draw upon considerable experience and expertise in aerospace matters. In addition, the Society has over 120 organisations who are members of its Corporate Partners scheme. The Society is responsible for the accreditation of aeronautical engineering courses in the UK.

Open decision-making in national science policy

2. Science and especially scientific methodology should be at the heart of evidence-based policy-making. However, scientific propositions, particularly when they inform commitments of large amounts of public money must be subject to rigorous peer review.

3. Science and scientists are not value free; the history of science and technology policy is not untainted by examples of scientific decision-making seemingly driven by personal or institutional lobbying. In the UK, arguably the decisions to develop the jet engine and the Advanced Gas-cooled Reactor were cases in point. In both examples, the closed nature of decision-making was dominated by small groups of government scientists and engineers committed in principle to the specific lines of exploration. In the case of the former, the resistance of a small group of establishment scientists who opposed a concept from outside their community delayed the development of Whittle's design. In the case of the latter, government scientists were wedded to an innovation they had pioneered whose practical flaws might have been exposed by external experts. While a more open system might have produced the same outcomes, fundamental errors of omission and commission in the evaluation of these programmes may have been avoided.

4. Over the last decade, a more insidious issue may be associated with the progressive transfer of Government's own scientific resources to the private sector, where scientific judgements may be subject to vested commercial interests. It is equally important that these activities remain accountable and subject to external scrutiny and independent peer review. This is linked to the idea that government should have the competence of an "intelligent customer"; but it has a wider set of implications in that those agencies in receipt of public money or investment should not be allowed to act as both advocate and evaluator of scientific propositions and programmes.

Public scrutiny and dissemination

5. The confidential nature of some areas of public policy may still preclude extensive reference to external bodies, but the assumptions and rationale of science-based programmes must be subject to adequate scrutiny. This might be achieved through routine application of "red teaming" approaches whereby major

scientific and engineering programmes must be defended against a deliberately hostile evaluation. Equally, confidentiality should be not automatically raised as a barrier to Parliamentary accountability. But more important in this part of the process, Parliament must be equipped with high quality of expert assistance to evaluate the more complex and technical policy issues. Advice must be expert and independent—not always easy to ensure. In this respect, the process of appointment should also be open to external scrutiny.

6. The Society shares the concern of many learned societies at the widespread paucity of general public scientific understanding. This in part reflects some decline in the teaching of science in schools, but also the tendency of popular media to exaggerate and to sensationalise scientific events and issues. There is no quick or easy counter to the spread of "bad science" and "quasi science", but it would be timely for the government and engineering community to partner in reviewing how effectively investment to date in efforts by qualified bodies to develop programmes designed to raise popular understanding of science and technological concepts has been exploited, and what more can be done..

The importance of applied science

7. A distinction does need to be made between pure and applied science. In particular, the Society feels that the engineering disciplines are not well represented in government decision-making. Although clearly science-based, engineering and other more applied technological approaches have a different methodologies and innovation trajectories. The continuing failure to appreciate this may reflect a long-standing criticism of the Haldane principle that it neglects applied science and elevates pure science.

Scientific advice to government

8. To manage applied technological and engineering issues more effectively, the Society suggests a dialogue between the government and the engineering community to establish how such issues might be afforded more emphasis in the work of the Government Chief Scientific Adviser and his Departmental colleagues. While science-based, Engineering does have a different methodological bias, predominantly founded on application and testing.

9. The Society is most specifically concerned to see Chief Scientists tasked to provide key advice on current major issues such as future energy or aviation policy balancing both the scientific and engineering viewpoints in order to create effective and actionable policy. Equally they would be tasked to ensure that public funds for research not only meet scientific objectives but also the potential for exploitation and wealth creation. The powerful signal to society that the Government needs and takes account of Engineering considerations would undoubtedly raise the profile and status of the CSAs and it should be a part of their role that it is required to improve public understanding of Engineering and advise on relevant educational process' and resources needed for a 21st century economy.

10. Scientific and engineering advice needs to be tempered by economic and commercial judgement and should be clearly integrated into mainstream policy evaluation. Given the complexity and long term nature of many modern scientific and technological investments, an essential element of this advice process should be the provision of a systems engineering perspective.

Regional investment and national strategies

11. The development of scientific and technological capabilities in the UK regions is an important factor in the promotion of regional economic activity. It is especially vital creating new sources of wealth creation in hitherto depressed areas. However, given the limitations on national resources, such investments must also make sense nationally. This is particularly important for science and technology based industries such as aerospace that compete in global markets. Regional centres of excellence should be set against national strategies and priorities.

12. This view also contains some implicit criticism of the Haldane principle that requires Research Councils to set their own agenda. While this should continue to be respected in principle, industrial end-user interests should perhaps have greater influence in determining the balance of resources allocated between individual areas of research.

January 2009

Memorandum 6

Submission from the UK Computing Research Committee (UKCRC)

Executive Summary

1. Our evidence covers UK research in computing, which is internationally strong and vigorous, and a major national asset.

2. We support the work of the Council for Science and Technology and the Cabinet Sub-committee on Science and Innovation but see the creation of a new Department for Science and Technology as a potentially more effective medium for bringing Science and Engineering to the heart of government.

3. UKCRC strongly supports the Haldane Principle as originally stated.

4. UKCRC does not support the case for a regional science policy in determining the allocation of government funding as this would lead to a weakening of the Haldane Principle. However, we do recognise that the UK has been less successful is utilising EU Structural and Cohesion funds to support science and technology and we argue for regional policies to address this.

Introduction

5. The UK Computing Research Committee (UKCRC), an Expert Panel of the British Computer Society, the Institution of Engineering and Technology and the Council of Professors and Heads of Computing, was formed in November 2000 as a policy committee for computing research in the UK. Its members are leading computing researchers from UK academia and industry. Our evidence reflects the experience of researchers who each have an established international reputation in computing.

6. The UK has always been exceptionally strong in computing research: the first modern computer was developed at Manchester University and ran its first program in June 1948; since that time, the UK has played a part in almost all the scientific and engineering advances in computing. Computer systems have transformed modern life but the world is still in the early stages of discovering, inventing and exploiting its full potential. UK computing research remains world-class,[22] and is a national asset that enhances the UK's international prestige, attracts inwards investment, and supports innovation for wealth creation and improved quality of life.

7. Computing is at the heart of almost every Government policy because almost every such policy requires new, and usually very complex, IT systems.

8. The projects to produce these systems have often overrun and both the projects and operational systems have often failed with concomitant delays in the implementation of Government policy and huge cost to Treasury. The scientific and engineering principles that could have helped to avoid most of the problems are well-understood and practical. Moreover, the requirement for modern computing science and software engineering at the heart of Government policy implementation has been presented in evidence to several Select Committee Inquiries over the past decade by UKCRC, the Royal Academy of Engineering and the professional institutions. Until this is understood, it would be foolish to believe that the UK can take a lead in the knowledge based economy or be able to implement Government policy in an effective way.

9. A hope has been expressed that closer integration of Computing Science and Software Engineering into public procurement of IT products could reduce delivery delays and costs, as well as the risk of failure, often embarrassingly publicised.

The need for a Department of Science

10. The Council for Science and Technology does valuable work but only meets on a quarterly basis. The Cabinet Sub-Committee on Science and Innovation is sub-committee of the Cabinet Committee for Economic Development and therefore only reports to Cabinet indirectly. Whilst UKCRC supports both of these initiatives, neither could be said to put science and engineering at the heart of policy-making. UKCRC supports the creation of a Department for Science and Technology but fears were expressed that this could become a mechanism for packaging scientific evidence to fit the prevailing political orthodoxy; adequate mechanisms must be put in place to prevent this.

[22] This has been confirmed by successive EPSRC International Reviews, the latest of which reported in 2007.

Strengths and weaknesses of the Government's current approach to formulating science and engineering policy

11. The creation of Departmental Chief Scientific Advisors and Scientific Advisory Councils has been a major advance in strengthening the Government's approach to formulating science and engineering policy.

12. UKCRC endorses the recent report by the Council for Science and Technology on *"How academia and government can work together"* which makes a number of key recommendations including the creation of exchange mechanisms (internships and secondments) and greater access to Ministers and ministerial buy-in to the creation of Scientific Advisory Councils.

Whether the views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is assessed

13. UKCRC believes that the views of the science and engineering community should inform the formulation of government policy. We have already elaborated on the computer science arguments in the Introduction.

14. UKCRC believes that the science and engineering community should be more involved in how the success of any consultation is assessed.

The case for a regional science policy

15. UKCRC strongly supports the Haldane Principle as originally stated. We are concerned that Government influence on the Research Councils' delivery plans and the effective top-slicing of RCUK funds to support initiatives such as the Energy Technologies Institute and the Technology Strategy Board diverts funding away from fundamental science and technology research.

16. Many of our EU partners make effective use of EU Structural and Cohesion Funds to support science and innovation; one example is the recent collaborations between the Portuguese Government and US universities (MIT and Carnegie Mellon University). The newly formed Board of the European Institute of Innovation and Technology (EIT) are expecting participants to use these funds to partially fill the funding gap between the Commission's allocated budget and the projected running costs (a gap of some €2 billion over the next four years). The UK does not appear to have been as effective as our EU partners in deploying these funds to support science and engineering and the regions have an important role to play here.

17. A regional science policy should not be used to influence the allocation of national funding and hence undermine the Haldane Principle still further.

Scrutiny of government science and engineering policy

18. We support the work of the Innovation, Universities, Science and Skills Committee and feel that its regular calls for evidence provide for an effective scrutiny of government science and engineering policy. Should the Government decide to create a new Department for Science and Technology, we would expect the scope of the IUSS Committee to be appropriately enlarged.

January 2009

Memorandum 7

Submission from the Met Office

SUMMARY

1. High profile science based issues (eg. climate change, genetically modified organisms) generate significant amounts of science based information and interpretation. There is a significant risk however that these interpretations serve a specific agenda or particularly lobbying position. The availability of authoritative, robust and objective science information and interpretation is crucial to ensuring policy is fit for purpose.

2. In many areas, scientific understanding is increasing rapidly and in many cases generating significant improvements in capability (eg the accuracy and capability of Numerical Weather Prediction). Emerging scientific understanding, and the capability it enables, can have an important impact on policy development. Effective communication of these, and likely future developments, is crucial to ensure policy is well formulated, "future proofed" and makes the best use of developing capability.

3. There is increasing pressure to ensure that research adequately supports policy development. However, care is required to ensure a proper balance between these more focused activities and more fundamental research. It may not be possible to address future policy questions in the future unless they are properly underpinned by fundamental research today.

4. In many instances there is an expectation that science will deliver definitive and clear results. The reality in many areas is that conclusions need to be drawn based on a balance of probabilities. Some conclusions are likely to be very well founded and others less certain. Policy needs to be developed in full recognition of the associated uncertainties and, if required, to accommodate them directly.

Introduction

5. The Met Office is a Trading Fund Agency owned by MOD. It is a world leading scientific organisation, both in the field of weather forecasting and climate prediction, operating on a 24/7 basis with the highest standards of operational resilience. Responsible for providing forecasts on all timescales (from an hour ahead to 100+ years), the Met Office is uniquely positioned to support the UK Government in its development of science- based policy in areas impacted by both climate change and severe weather events.

6. An independent review of the Met Office Hadley Centre concluded, amongst other things, that "*It is beyond dispute that the Met Office Hadley Centre occupies a position at the pinnacle of world climate science and in translating that science into policy advice*".[23] The work of the Met Office Hadley Centre has allowed the UK Government—through Defra—to play a leading role in gaining global acceptance of anthropogenic climate change and developing mitigation and adaptation strategies. The major contribution made by the Met Office Hadley Centre, both to the recent Stern Review and to the Intergovernmental Panel on Climate Change (IPCC) Fourth Assessment Report, are two recent examples of just how vital and high profile its climate prediction work now is to Government policy.

Policy focussed science at the Met Office

7. The UK leads the way in a science-based approach to dealing with climate change. It is at the forefront of international negotiations on mitigation and adaptation, and in providing climate change information in the UK for adaptation through the UK Climate Impacts Programme.

8. The UK government currently invests around £20 million p.a. in climate research at the Met Office Hadley Centre through DECC, Defra and MoD. This is underpinned by significant investment in model development at the Met Office to improve weather forecasts. Exploitation of the synergies between operational weather forecasting and climate predictions strongly benefits both activities and maximises value for money. The recent merger of two separate research programmes into a joint MOD and Defra Climate Prediction Programme at the Met Office is an excellent example of a coordinated approach to climate change research that will further strengthen the quality of advice provided to government on the underpinning science. This joint programme provides a framework by which the departments can coordinate their interests while the Met Office builds on the excellent fundamental science carried out in the UK research community and translates this into policy relevant advice.

9. Although there is significant and close coordination with Defra and DECC, changing climate patterns and incidence of extreme weather events have far-reaching socio-economic impacts and science advice can therefore underpin policies from all Government departments—from infrastructure to energy to food supplies to health. It is also important to note that the effects of a changing climate will be felt on a global scale and may therefore have a direct impact on international investment and policy.

Scientists and policy makers

10. In order to ensure policy is developed and reviewed in light of the best science advice available, policy makers must first recognise how science can inform policy and then engage the science community at the earliest opportunity. For their part, scientists must not only recognise the relevance of their research to policy but, crucially, also be able to communicate it effectively.

11. A science-based approach to policy development can only be effective if there is strong coordination between Departments and the science community—both to communicate emerging policy requirements and to ensure that science is directed towards policy. The use of inappropriate or out dated scientific advice could lead to poor investment decisions and/or ineffective policy.

[23] An independent review of the Met Office Hadley Centre from Risk Solutions commissioned by Defra and MoD was published by Defra on 15 May and is available on the Defra website: http://www.defra.gov.uk/environment/climatechange/research/

Limitations and uncertainties in science

12. Just as policy is required to change and develop with changing socio-economic factors, policy makers must also be aware of the influences and driving factors that stem from our changing understanding of science.

13. Science cannot, and should not, provide a fixed, prescriptive answer to policy questions in most areas and certainly not when considering climate change projections or when developing policy to deal with the impacts of extreme weather events. Science advice should be provided based on the best understanding we have now but policy must remain flexible enough to adapt to new research and developing technologies that enable the delivery of breakthrough science and increased capabilities.

14. Although flexible enough to adapt to improving science advice, policy must still be fit for purpose and provide a real framework within which the UK can compete and develop on the international stage. When using science to inform policy decision there are two extremes to be avoided: total and complete belief that projections are fixed and paralysis by the uncertainties presented.

15. Key to ensuring these extremes are avoided is direct communication between policy makers and the science community. Climate change projections, for example, have been widely reported in the media. Taking science and research findings from second hand sources without understanding the limitations and uncertainties involved may lead to policy makers having a distorted view on the exact message coming from the science community.

Confidence in policy and the underpinning science

16. Only through policy makers taking advice directly from the most authoritative sources can we be sure that policy is underpinned by the best science advice available. Policy makers must understand the limitations and the impacts of the uncertainties in the science and scientists must be open and honest about these and communicate them effectively. Not doing so can only undermine public confidence in Government policy as well as leading to ineffective policy and wasteful investment.

17. In turn, confidence that the science advice being offered is the best available can only come from a recognised independent authority undertaking robust scrutiny and peer review.

Blue sky versus application oriented research

18. Although there is a policy need for science research to be directly application oriented (with increasing fiscal and environmental pressures for this to continue) there are significant benefits in maintaining "blue sky thinking". It is through the outcomes of this conceptual research that many major breakthroughs in science come to the fore and, when brought together with other research and influences, give rise to more high-level policy change in the longer term.

January 2009

Memorandum 8

Submission from Energy & Utility Skills

1. Executive Summary

Introduction

2.1 Energy & Utility Skills is the Sector Skills Council for the electricity, gas, waste management and water industries. Employer-led, our purpose is to ensure that energy and utility businesses have the skills needed to efficiently meet their business aspirations. With some 528,000 employees, the energy & utilities sector is of vital strategic importance to the UK.

2.2 Our sector faces advancing technology, rapid change, global competition and rising expectations of choice. The skills of our people and their continuing development, are crucially important to employers and employees.

2.3 Four strategic objectives drive our approach to delivering on our purpose: act as a catalyst in developing a sustainable skills market; use productive relationships to influence stakeholder policy development; deliver industry standards and qualifications, market intelligence and strategic skills foresight; and be a high performing sustainable business.

2.4 Our work on our Sector Skills Agreement (SSA) has reinforced our purpose and given us a strong platform to further develop and deliver skills solutions for the sector. We are currently taking forward the key skills issues identified in our SSA. We have also developed a Sector Qualification Strategy (SQS) and will begin implementing this during 2008. Our research programme will ensure that EU Skills is an authoritative source of foresight, labour market and supply side information and intelligence.

2.5 We work with central government and the governments in Northern Ireland, Scotland and Wales to both influence and respond to the skills strategies for each nation, in order to meet the skills needs of our sector. We also operate in each of the English regions.

2.6 EU Skills welcomes the opportunity to respond to the IUSS Committee Inquiry on putting science and engineering at the heart of government policy as this is a critical issue for us. We have a well established, and comprehensive, network of employers, who are engaged through regular contact by our national and regional Skills Directors and industry leads. We also have well established high level employer strategy groups and workgroups for each of the four industries in our footprint. This response has been compiled using feedback from our employer networks and comments have also been invited via our website. We have detailed our response below.

Consultation Response

3.1 The IUSS Committee has invited feedback on the following points:

- Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science;
- How Government formulates science and engineering policy (strengths and weaknesses of the current system);
- Whether the views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is assessed;
- The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating;
- Engaging the public and increasing public confidence in science and engineering policy;
- The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy;
- How government science and engineering policy should be scrutinised;

3.2 Engineering and science skills are critical to the development and success of our sector. They are also critical to the economic success of the UK. We face many challenges in ensuring that our sector has the right skills to develop, compete and advance over the next 20 years.

3.3 We are convinced that action needs to be taken to address the skills challenges we face over the next 20 years in order that the industries within our sector can transform. The industries themselves have a history of developing their workforces and industry collaboration has resulted in successful developments such as the Power Academy, a recently announced NSA for Power and a Water Skills Action Plan (driven by industry collaborations PSSSG and WISSG[24]). However, government action is now required to establish science and engineering policies that will act as a catalyst and stimulate a focus on skills development.

3.4 The commitments to developing a low carbon economy, greener energy sector and meeting climate change targets means our sector needs to reflect its changing environment and develop and implement new technologies. Alongside this requirement, there is a need to build new energy infrastructure to replace old nuclear and coal-fired power stations that are due to be decommissioned. The recent Business and Enterprise Committee report[25] on energy policy estimated a huge investment will be required to rebuild our energy infrastructure.

3.5 In addition, the sector has an ageing workforce and is faced with a declining number of young people entering the workforce. There is low interest in science and engineering subjects at school and international competition for science and engineering skills. This means that suitable candidates for skilled roles, such as those that are central to establishing continued improvements in productivity to meet the requirements sought by the economic regulators, are scarce. Work is needed to ensure that the sector is perceived as an attractive career choice for young people and those from non-traditional employment pools.

3.6 There is good evidence to suggest that those who come to work for the sector stay for significantly longer than the UK average. This suggests that, if the challenge of getting candidates across the doorstep can be addressed, our sector will be able to meet the upskilling challenge needed by its workforce to meet the challenges ahead.

[24] The PSSSG (Power Sector Skills strategy Group) and WISSG (Water Industry Skills Strategy Group) are industry-led groups consisting of senior members of companies from the power and water industries, facilitated by EU Skills.

[25] House of Commons Business and Enterprise Committee (December 2008) *Energy policy: future challenges*—First Report of Session 2008—09, paragraph 26.

3.7 We are less convinced, however, of the need to establish a separate Department for Science. Skills policy needs to be much better coordinated across the UK, between government departments and agencies and across national and regional boundaries. The feedback from our employers is that the skills environment remains confusing in relation to policy formulation and delivery and the multiplicity of initiatives and funding arrangements. This complexity has been acknowledged in the recently published UKCES document Simplification of Skills in England.[26]

3.8 At the moment, education and skills responsibility is split across two Government departments in England: DIUS and DCSF. The Scottish Government, the Assemblies in Northern Ireland and Wales have devolved responsibility for policy in relation to education and skills. DWP also has a role to play in the skills agenda. Our sector also links to the responsibilities of DECC and Defra. We welcome the creation of DECC bringing together responsibility for climate change and energy policy and are keen to support the sharp focus that this will bring to energy policy. However, we believe that, for skills issued to be addressed, a joining up of approaches across government is critical and the creation of a further government department could potentially create more complexity. It is important that all government departments involved in the energy and utilities sector have a shared vision for skills development across the sector.

3.9 We believe that employer involvement should be central to the formulation of science and engineering policy. The voice of employers on science and engineering skills can be accessed through the Sector Skills Councils. We are a member of the Science Cluster of SSCs that is led by SEMTA.

3.10 The work on our Sector Skills Agreement[27] and ongoing feedback from our industry groups illustrates a desire from our employers to get closer to policy formulation and also skills delivery, based on a robust national strategy for skills development for each industry. Our employers believe there needs to be a stronger link between their views and understanding of their industries and government policy and decision making. We also feel that any regionally driven policy and or initiatives should be linked into regional employer networks who, in turn, should be aligned and linked to national sector and industry strategies.

3.11 We have achieved high profile successes for our sector, based on industry collaboration. Our successes include:

- Delivering a three year Ambition Energy programme that enabled over 2000 unemployed people to enter a long term sustainable career within the energy sector. Over 85% were still in employment six months later;
- Designing an implementing a workforce planning tool that enables individual companies to forecast their skills needs over the next 15 years;
- Transforming £1.6 million of ESF funding into a £72 million investment in skills development by Ofgem;
- Driving employer support and investment of over £750,000 for a National Skills Academy for Power that was announced in September 2008.

We are working with our industry groups to address many more of the challenges the sector faces and ask that a coordinated government approach to science and engineering policy focuses on employer involvement. This means a policy that is developed through active involvement of employers whilst ensuring that the diverse number of bodies with a strong interest in science and engineering capability are aware of the industry-sponsored approaches being developed and are asked to actively work with employers towards long-term mutual value.

3.12 If we are to address the skills shortages and gaps we face in the UK in relation to science and engineering that are evident in our sector, we will need joined-up government thinking. This requires a joining up of action across GO-Science, charities, learned societies, RDAs and other stakeholders that you mention in your brief—along with industry—bearing in mind that a fully competent engineer takes three to six years to train to full competence. This is a significant challenge and if the UK is to realise the full potential of innovation, skills issues need to be addressed as a matter of urgency. We see some of the main solutions as detailed below:

- Working with government/s to modify immigration rules in the short term, whilst investing in skills development in the UK;
- Providing accessible funding to upskill existing technically skilled people in our companies to higher levels;
- Ensure that appropriate training is available to meet employers' needs (eg, through collaboration with Foundation Degree Forward and other bodies);
- Develop the training capacity to deliver the level of engineering skills that the industries are now identifying (evolving through work with the economic regulators on the investment needed for long term skills);
- Teachers training through industry on engineering skills and challenges;

[26] UKCES (October 2008) *Simplification of Skills In England.*
[27] EU Skills (2006) *Sector Skills Agreement Stage 1.*

— Creating training facilities as "safe" places for young people to obtain exposure to engineering in a practical way;

— Creating engineering focused teaching or e-learning packages for curriculum support;

— Support existing engineering students—develop our industries' links with Universities (eg., via the Power Academy);

— Obtain maximum industry impact on engineering initiatives, eg, working collaboratively to support the 14–19 Diplomas;

— Using young engineers within each industry to reach out via social networking such as podcasts, video-casts etc., placing engineering in the attractive light that our employees understand first-hand;

— Add an engineering positive image to the safety messages that our industries often take out into the primary school system.

3.12 We see the approach as a collaboration between government and industry. However, each company can make its own contribution, individually and collaboratively. We will also continue to work with our sector collaboratively to influence the economic regulators to support further investment in skills development. We will also work with other Sector Skills Councils in the Science Cluster and the network of National Skills Academies to form and deliver collaborative solutions.

Conclusion

EU Skills welcomes the opportunity to respond to this inquiry. We hope that the comments made in this response will help the Innovation, Universities, Science and Skills Committee in its deliberations.

January 2009

Memorandum 9

Submission from AstraZeneca

Summary

— A robust, long-term national science and engineering strategy that stretches from fundamental science through to applied and translational activities that will ensure economic impact and rapid exploitation is required.

— A new Department for Science is not required, rather science should be fully embedded in all Departments. A common process of expert strategic consultation coupled with integration and coordination of science across and within government departments and the Sub-Committee is needed.

— Science and engineering advice should be at the core of policy development and sought from a wide range of stakeholders.

— Greater focus on building public trust and confidence is urgently needed and will better enable the UK to take scientific leadership and deal with critical scientific challenges.

Submission

1. AstraZeneca is a global pharmaceutical company engaged in the discovery, development, manufacture and marketing of new medicines for the treatment of infections including tuberculosis, cancer, metabolic disorders, cardiovascular disease, neuropsychological, gastrointestinal, respiratory and inflammatory disorders. Our innovative products bring benefit to patients throughout the world.

2. AstraZeneca is pleased to contribute to this inquiry. As a successful major pharmaceutical company AstraZeneca values working in partnerships with stakeholders in the science base to ensure a vibrant and sustainable biomedical research base with the capability to develop and deliver to market products, technologies and services.

Question 1. *Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science*

3. If the UK is to remain globally competitive it must create and enact a robust, long-term national science and engineering strategy that stretches from fundamental science through to applied and translational activities that will ensure economic impact and rapid exploitation. Such a strategy would be founded on the major global challenges of health, sustainability, nutrition and minimising environmental impact but also incorporate the needs of existing and emerging knowledge based industry, skills development and capacity needs and an indicative investment plan for the research and engineering base. Science and engineering strategy is fundamental to the development of policy across most if not all Departments of Government and at the present time coordination between Departments is weak and the processes by which expert advice and consultation are sought are inconsistent. Such a strategy is important if the UK is to remain an attractive location for pharmaceutical research.

4. AstraZeneca welcomed the creation of the Cabinet Sub-Committee on Science and Innovation with direct access to the highest level of Government. If the UK is to be successful in taking forward a knowledge driven economy then it is vital that there is integration and coordination of science across and within government departments and the Sub-Committee must act to ensure that this takes place. Given the diversity of the Science and Engineering agenda and the varied position of different Departments along the "fundamental research through exploitation to technology procurement" chain, in AstraZeneca's view a sufficiently empowered Cabinet Sub-Committee is preferable to forming a new Department of Science.

5. Further steps must be taken to fully embed science in all Departments and to ensure common processes of expert strategic consultation and coordination. This will require strengthening departments by employing more scientists within Government, creating mechanisms to ensure effective knowledge exchange and networking both within government and outside, to ensure that scientists in leadership and policy development roles can keep up to date with current scientific and engineering developments.

6. Leadership for the health of the UK's essential fundamental science and engineering base should be retained by DIUS but there is much further to go in terms of developing strong and effective working relationships with other departments. The creation of the Office for Strategic Coordination of Health Research (OSCHR) is a welcome positive development to ensure strategic coordination between MRC and the Department of Health and to drive translation but the current situation is much poorer for essential interfaces between (for instance), DIUS, DEFRA, NERC and the Home Office.

7. The Council for Science and Technology has produced some good reports, although the mechanism to identify future subjects and the evidence gathering process are not always clear.

Questions 2 and 6. *How Government formulates science and engineering policy (strengths and weaknesses of the current system) , the role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy*

8. The lack of an over-arching high level Government strategy for Science and Engineering and a clear process for its creation and renewal leaves too much room for Departments to interpret and create their own strategies. The main Research Councils within DIUS come closest to having a science and engineering strategy creation process that is understood by their user communities.

9. Sound science policy-making is dependent upon expert scientific advice, wide evidence and consultation, and talented staff with the ability to develop and drive forward agreed policy. Considering the whole "fundamental research, through development and exploitation chain" it is necessary and beneficial to seek input and comment from a wide variety stakeholders including medical charities, learned societies and industry. Some such as major Pharma have strategic interest in the whole chain, whilst others such as the Regional Development Agencies maybe only interested in exploitation and new business development. There should be clear measurable outcomes with end points that can be identified and mechanisms to monitor the outcomes of policy levers and to ensure that such information is used to shape future policy decisions.

10. Many of the problems that currently exist could be addressed by a better understanding and dialogue between the relevant sectors of scientific practice, for example the UK is training more STEM graduates than ever before but industry is still unable to find appropriately educated staff. A meaningful dialogue between universities, industry and government could address these issues head-on.

11. The role of the Chief Scientific Advisor and the creation of a close network of chief scientific advisor positions in most government departments are welcome developments and they could play a strong role here. Continuing to develop and strengthen this network is critical to ensure appropriate involvement in science spending, policy development and implementation.

12. Departments should be encouraged to attract well-qualified scientific staff and further develop capacity in this area in order to provide expertise in policy making across government. One suggestion would be to make use of short-term secondments or appointments for scientists for specific projects and encourage greater inter change and connectivity with scientists in industry. Furthermore although the value of former academic scientists into government and in advisory roles is unquestioned, more value could be added by similarly involving scientists from industry, particularly large companies.

Question 3. *The views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is assessed*

13. The knowledge (not the views) of the science and engineering community is vitally important to robust policy development. Identification of future science related issues is a critical component in policy making. Horizon scanning should be coordinated across government and include individuals from different departments. It is important that a wide spectrum of scientific expertise is used and including the industry sector and social science community.

14. Evidence gathering and research commissioned by government departments should be of the highest quality and involve appropriate use of scientific experts. Where possible consistent and transparent processes should be used for gathering evidence with the widest applicability, thus avoiding multiple studies and consultancies by different Departments.

15. The current consultation processes aim to reach a broad stakeholder base and are valuable. However, it is not clear when and if such information, advice and evidence offered through consultation is taken up and utilized in policy development.

16. A clear international perspective is vital in science and engineering policy-making especially if Government wishes to engage fully its key global industrial players. A good example is new science required to combat and deal with emerging infectious disease, stretching from epidemiological trend through to the latest advances in DNA vaccines. Scientists within key Departments must forge stronger and more influential relationships with European and US counterparts to share knowledge and to identify early areas for collaborative policy development.

Question 4. *The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating*

17. It is important that an over-arching National science strategy is developed under which a consistent set of policies can be constructed. These should be implemented nationally and regional bodies should follow the strategy developed at a national level and not create new or variants. A number of the Science Councils exist within the Regions and along with the Devolved Administrations these have a role to play in the implementation of policy and alignment with local strengths and needs. However the solutions to many national problems in training and education support cannot be solved by regional approaches, particularly as the systems operate currently.

18. The UK will benefit if the regions and devolved administrations work closely together to ensure the supply of a critical mass of relevant skilled scientists and engineers able to tackle the scientific challenges presented by effective treatment of disease, sustainable energy, climate change and an ageing population. The Research Councils, funding Councils and Technology Strategy Board also have key roles to facilitate this.

19. The Haldane principle should be maintained. It has served the scientific community well and still enables Government to ring-fence budget for strategic priority research whilst allowing scientists freedom to direct research.

Question 5. *Engaging the public and increasing public confidence in science and engineering policy*

20. DIUS has recently conducted a consultation on its vision for a new science and society strategy. We await the outcomes of that work. In addition there is a reasonable body of activity in the UK sponsored by ESRC and other bodies on societal impact of science, public engagement and dialogue. The strategy and planning of this work should be more strongly coordinated with fundamental science and engineering strategy of key Research Councils.

21. We believe that engagement with science needs to begin at a young age and this should be an essential component in Government policy. Confident teaching of science in schools including the delivery of a balanced appreciation of more difficult topics such as the use of animals and nuclear energy is critical. Considerable steps have been made in raising awareness of science, by industry through Science and Engineering Ambassadors, the STEM Programme led by Professor John Holman, the work of museums, science festivals and a variety of public and private initiatives. Attitudes to science are improving with growing interest in issues such as energy, climate change and medicine. However, more could be done to improve scientific literacy and understanding.

22. Providing useful information in a usable and meaningful form to a broad range of groups has greatest impact. Traditional media routes and new forms such as the web can be successfully utilized. However, much more needs to be done. There are still negative perceptions about science and scientists and there needs to be a step change and concerted action to alter the negative public.

23. In support of this there is a pressing requirement to link science policy to communication policy across government departments and for each department to own all the issues, including the difficult ones like GM foods, use of animals in research and nuclear energy.

24. There is still a need to bring science into an everyday context and demonstrate the role of scientists and the impact of scientific discoveries and technological developments. An ongoing public dialogue on important science –based challenges and technologies should be encouraged and an appropriate format developed. This should promote informed and open debate on the scientific challenges, risks and potential solutions, priorities and choices. By building public trust and confidence the UK will be better able to take scientific leadership of some key topics and to deal with the scientific challenges. A coordinated effort involving government, industry, learned societies, medical charities and other stakeholders would be required.

25. It is also important to monitor progress on science literacy and a survey of public attitudes to science should continue.

Question 7. *How government science and engineering policy should be scrutinised*

26. The former Science and Technology committee was well placed to scrutinise the science policy across all government departments. Placing the committee within DIUS runs the risk of diminishing the strength of this group. Further benefit could be gained by making more visible the outcomes of scrutiny.

January 2009

Memorandum 10

Submission from the Geological Society of London

Science and Engineering at the Heart of Government Policy

As the leading learned society on geological matters the Geological Society recognises the value, hence importance, of science and the need for it to be at the heart of Government policy. We are grateful for the opportunity to respond on this important subject.

Summary

— The conception of science as a particular form of organised knowledge about the natural world is a peculiarly Anglophone interpretation. In other cultures, including all other European countries, "science" means organised knowledge about anything. This shows how important it is to understand how questions on this issue are influenced by our culture, and above all the English language.

— In addition, within what English speakers think of as "science", the boundaries between classic disciplines like chemistry, physics, biology, geology are breaking down. Many of the problems we face require moving between disciplines, or outside of what we traditionally regard as "science". The Government's formulation of science and engineering policy needs to reflect this.

— The current Government has over the best part of a decade restored science investment lost in the decade up to the 1998–9 financial year. This is appreciated and to the benefit of UK PLC. However science is still not fully effectively recognised in the policy-making process and is on occasion actively ignored. Nor is it strongly represented and coordinated across all Government Departments. We favour a more focused and coherent system which might involve the creation of a Department for Science.

Specific Questions Addressed

Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science

1. The Cabinet Sub-Committee on Science and Innovation and the Council of Science & Technology do not have the remit, and therefore are unable, to put science & engineering at the heart of Governmental policy-making.

2. In light of problems with the current system, detailed below, we favour a more focused and coherent system. This might involve the creation of a Department for Science, if that mechanism, given the proper powers and responsibilities, could better direct the questions posed by other departments of State to those best placed to provide meaningful answers. At one time this was a role undertaken by the Science and Technology Secretariat within the Cabinet Office.

How Government formulates science and engineering policy (strengths and weaknesses of the current system)

3. The breakdown of boundaries between scientific disciplines is nowhere more evident than in our efforts to understand the Earth system—the complex web of influences that control our ever-changing global climate. Here as nowhere else, disciplines must work together to bring all their specialist knowledge to bear on creating a new, unified scientific worldview that incorporates everything from cosmology and solar physics through geochemistry and biological evolution to chaos theory.

4. The current system whereby Government departments and Parliamentary bodies obtain scientific advice is, we feel, rooted in a world view where subjects under discussion were easily defined as falling either in one domain of science or another. As many of those topics now include aspects of environmental change and hazard prevention or mitigation, this is no longer even remotely true.

5. Moreover, many of the issues we now face require even moving outside "science" as English speakers usually describe it. This is because many of the solutions to our current problems involve motivating large numbers of people to behave differently, and in the process engaging ordinary non-scientific and non-technical people in those decisions—many of whom will either be uncomfortable—or appear to be uncomfortable, which is for the purposes of political change, the same thing.

6. With this in mind, we feel that it is worrisome that the recourse in most circumstances when scientific advice is sought is to The Royal Society, foremost and in many cases, in isolation. The Royal Society is an august body but represents a very small proportion of the whole field of scientific and technical endeavour and is highly biased towards research and to academics, who are not always best placed to understand the practical issues that need to be addressed alongside the theoretical ones.

Whether the views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is assessed

7. The views of the science and engineering community should be central to the formulation of Government policy. However the way the majority of consultations are conducted (as compared with the Cabinet Office Guidelines as the official standard) demonstrates that policy makers do not really value science unless there is a very specific scientific question needing to be addressed necessitating specific technical knowledge. Transferable science skills to the broader social arena are not valued.

8. It would be useful to have not just the outcome of a consultation assessed against the overall evidence submitted but also that the outcome is assessed against evidence received specifically from the independent scientific community (this includes learned societies). Then it would be more easily possible to see whether the science views had been considered.

Engaging the public and increasing public confidence in science and engineering policy

9. Public confidence in science and engineering cannot be improved until Government Departments and Agencies demonstrably appreciate (through investment and action) that they themselves have confidence in science and engineering. At the moment science and engineering concerns are not managed and addressed in a co-ordinated way across Government as they might. For example not all Government Departments have as strong a recognition of the value of science. Here for instance there is the Department for Culture, Media and Sports which seems to be slow in developing its own effective science resources. This lack of DCMS value percolates through to its related agencies.

The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy

10. We at the Geological Society have a record of building upon our science's naturally multidisciplinary nature to address pressing problems by drawing many scientific societies and interested parties together in framing recommendations and facilitating discussion. For example, our recent meeting on Radioactive Waste Disposal (24th October 2008: http://www.geolsoc.org.uk/gsl/events/past/geological_disposal) brought in expertise from many different fields and included a wide range of practising and academic geologists, local government representatives from potential volunteer communities, members of regulatory bodies and government departments, representatives of interested NGOs, those from other scientific societies and members of the public. In doing so, the meeting recognised that the solution is not a geological problem alone, any more than it is a civil engineering, or metallurgical one—it involves all these disciplines and more—including sociology and people who know about public engagement.

11. The problem at the moment is that there is no clear-cut, overarching management of science policy across Government and so issues can and do fall between the cracks. These include both specialist issues (for example of concern to geologists) and generic ones (of concern to most scientists). An example of the latter might be the actual and perceived value (hence utility) of a reasonably good BSc to a prospective undergraduate: science career concerns have been passed from pillar to post despite much political rhetoric over the past three decades. An example of a specific concern to geologists falling between the cracks is that of systematics. Geologists working in palaeoecology need to be able to identify fossil plant and animal species. Here the issue, despite three Select enquiries over the past quarter of a century, has fallen between education agencies and Government Departmental stools with nobody charged to take ownership of implementing the solution.

12. Again of concern to geologists, that issues seem to return again and again without being addressed was a matter that cropped up on three occasions during last year's DEFRA Science Advisory public meeting. Because of this fundamental lack of tactical management, simply re-arranging the relationship between deckchairs— GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders—will have far from maximum effect.

January 2009

Memorandum 11

Submission from the British Science Association

SUMMARY

1. The activities of the British Science Association (known formally as the British Association for the Advancement of Science) concentrate on public engagement. This evidence therefore concentrates on the specific aspect, identified by the Committee, of engaging the public and increasing public confidence in science and engineering policy. It reiterates many of the points made to the DIUS in its consultation on a Vision for Science and Society.

2. Our vision is of a society in which science and engineering advance with the involvement and active support of the public. Such a society is one in which the scientific and engineering communities, policy makers and the public share a common and open culture of science and its applications, enabling people from all walks of life to access science, engage with it and feel a sense of ownership about its direction. It is this embedded culture, we believe, which is likely to lead to increasing public confidence in science and engineering policy.

3. Developing this culture requires people, both scientists and non-scientists, to share views and understandings of the benefits, opportunities, priorities and concerns about the directions of scientific research and its applications through technology and engineering. Though much has been done in recent years to develop systemic and collaborative approaches to public engagement, and the UK can be justly proud of this, barriers do remain to creating a fully shared culture which is essential for achievement of the vision. Face to face contact and direct discussion is important for developing trust and for sharing and exploring ideas in depth.

4. It is important for Government to be clearer about when it is communicating and when it is consulting, and within what parameters. We also offer two substantive options for better use of public engagement in consultations, which would be likely to lead both to more widespread public engagement and information, and to demonstrate more clearly public input to the policy process:

a. The deliberate and active use of significant policy consultations as opportunities for mass public education about the science and the associated issues.

b. The collecting of public views and ideas from much wider and more diverse sources than those of traditional stakeholder or structured intense deliberative processes.

5. We see a clear parallel here with the work being carried forward in the science education sector through the STEM Programme, and we propose the development of a Science in Society Framework, analogous to the STEM Programme, which would act to bring coherence to the broad field of science in society activities, while recognising and supporting local action and innovation. Such a framework, developed by a collaborative effort of the organisations currently involved in science in society activities, would lead to the developments of plans in specific areas, which could include:

a. Professionalisation
b. Dialogue and consultations
c. Science as a creative and cultural activity
d. Measures of success

Creating an Open Public Culture for Science and Engineering

6. As the Secretary of State for Innovation, Universities and Skills said in a speech on 10th January 2008, reflected in the Government's recent consultation document, "Our ambition should be … a more mature relationship between the public, the media, and scientists, where everyone understands each other. In particular, it means the public and the media maintaining the same healthy scepticism that they do towards other information they consume. Not taking the scientists' conclusions for granted, but questioning what the real implications of the evidence should be."

7. It is a shared culture based on a more mature relationship that should be at the centre point of thinking about public engagement, since within such a shared culture it is more likely that:

— scientific and technological careers will be attractive and valued
— the scientific workforce will reflect our diverse society
— public confidence in science and its governance will be high
— the contributions of science and technology will underpin shared social and environmental goals, and in consequence economic benefits with respect to national growth and international competitiveness will be optimised.

8. The past 20 years, punctuated and influenced by significant events such as the publication of the Bodmer report in 1985, the Chief Scientific Adviser's Guidelines in 1997 and subsequently, and the House of Lords Science and Technology Committee report in 2000, have seen an extraordinary development in activities variously described as public understanding of science, science communication and public engagement with science, both in relation to policy and to wider aspects of public awareness and involvement. The field is both increasingly extensive and increasingly diverse, with different organisations having different reasons or different emphases for engaging with the public.

Public knowledge, attitudes and cultures

9. The UK has a strong pro-science culture, evidenced by survey data which shows that people overwhelmingly appreciate what science contributes positively to society and to our quality of life. But the public has major concerns too. On examination these tend to revolve around specific issues, such as GM technology, stem cells or nuclear power, and around the governance and regulation of science and its applications. These concerns are driven in particular by conflicting ethical positions or values, and by the degree of trust (or the lack if it) that people have in systems of governance and accountability. Approaches to public engagement which seek to convince and reassure the public on purely rational scientific grounds (and tend to characterise the public as ignorant) without taking account of these values and perspectives are almost certainly doomed to failure.

Scientific culture

10. The recent survey of the attitudes of scientists towards public engagement, commissioned by the Royal Society in 2006, showed that scientists view the purpose of this activity primarily in terms of informing the public. That is an important role for scientists, and one which many carry out with commitment and skill. Indeed the public themselves recognise scientists as a prime and trusted source of information about science. However, it is only half the picture. The public also demand that scientists "listen more to what ordinary people think". This two-way communication or dialogue has been emphasised since the House of Lords Science and Society report in 2000. This requires a reflexivity and indeed at times humility among the scientific community that is not widespread. The ethical code is a helpful signal and mechanism for encouraging this self-reflection. What is being asked is not for scientists to be formally directed through public opinion, as characterised by some, but for the scientific community to be open to a continuous discussion of values and purposes, and to be sensitive to those when developing avenues of research. As with their involvement in the more didactic forms of science communication, there are many scientists who

demonstrate leadership in this respect, and yet involvement in this wider debate and discussion is still not seen as a fundamental part of being a scientist. It is indeed a question of culture, and the recent Beacons for Public Engagement initiative is aimed in particular at addressing this.

11. Face to face contact between scientists and the public is an important aspect of building understanding and trust. Mass communication methods alone will not achieve this. It is face to face contact and dialogue that underpins the work of the British Science Association and lies at the core of our programmes.

Political culture

12. Public trust in the governance of science, in regulation, and the policy-making process through consultation is critical for science's ultimate licence to operate. Here there have been substantial positive moves, with increasing numbers of open meetings of, for example, Research Councils and regulatory bodies, and minutes being published on the web. The whole area of military R&D, though, is one that remains largely closed and outside public discussion. There are often sound reasons of national security for this situation, but opportunities could be sought for greater openness here too.

13. It is through consultation processes, and the way in which the Government, regulatory and advisory bodies are seen to respond to those, that long-term trust can be established. Certainly the established formal processes for Government consultations set a firm framework and perhaps there will always be some public cynicism about Government motives and practice. To counteract this, we believe it is important for Government to be clearer about when it is communicating and when it is consulting, and within what parameters. A consultation which appears, whether rightly or wrongly, to be carried out after a decision has already been taken, does much to create distrust in science and its governance, regardless of what scientists do.

14. We offer two substantive options for better use of public engagement in consultations, which we believe would be likely to lead both to more widespread public engagement and information, and to demonstrate more clearly public input to the policy process:

1. The deliberate and active use of significant policy consultations as opportunities for mass public education about the science and the associated issues.
2. The collecting of public views and ideas from much wider and more diverse sources than those of traditional stakeholder or structured intense deliberative processes.

   Both the consultations on GM and on energy would have benefited hugely from such approaches, and potentially improved their credibility significantly.

Removing barriers to culture change

15. Culture change takes time but we should recognise what has already been achieved, which includes:

— increasing access to information about science (eg through the media, internet and science centres)
— increasing access to opportunities to engage directly with scientists (through the programmes of many science-based organisations, and initiatives such as National Science and Engineering Week and science festivals)
— signals from key funding organisations (eg Research Councils, Wellcome Trust) that public engagement work is important
— examples of "upstream" engagement
— the UK Resource Centre and its championing of aspects of diversity
— Beacons for Public Engagement, as means of encouraging culture change in the HE sector
— the Sciencewise Expert Resource Centre with its emphasis on the culture of policy-makers

All these developments, and more, create a positive platform for further change and we now need to embed the thinking behind these activities.

Towards a strategy

16. We see a clear parallel here with the work being carried forward in the science education sector through the STEM Programme. We therefore propose the development of a Science in Society Framework, analogous to and contiguous with the STEM Programme, which would act to bring coherence to the broad field of Science in Society activities, while recognising and supporting local action and innovation. The group of organisations which met twice, convened by the British Science Association, during the consultation on the Vision for Science and Society could form the basis of a wider non-exclusive collaborative In working together we recognise that, although the Government can set some strategic parameters and provide resources and support, much of the required work called for is best achieved through supporting and building on the collaborative activities of existing organisations.

17. The suggestions below are the result of initial discussions and simply form a starting point for further work. The development of a Science in Society Framework might lead to several work streams:

— Professionalisation

This work stream would look at the training and development needs of the sector (scientists and others involved in science communication) against current provision, and a framework for continuing professional development. It would address the associated reward and recognition structures, and for example the question of embedding of these in the Research Excellence Framework. It would cover education and development from age 18, considering for example the recommendation that all science/engineering students in Higher Education be exposed to the wider aspects of communication, ethics and society in relation to science and engineering.

— Dialogue and consultations

"Dialogue" is a much used concept but hides many assumptions and purposes. This work stream would seek to bring coherence and clarity to dialogue activities, whether carried out for normative purposes or for instrumental ones such as policy consultation and development. Other corresponding work streams might be developed for common areas of activity such as science outreach (with its overlap to the STEM Programme) or science press and PR activities.

— Science as a creative and cultural activity

Much of the rhetoric and drive for science policy centres on economic arguments. Though these arguments are powerful and important, they risk characterising science as a purely utilitarian pursuit. The intrinsic creativity of scientists and engineers, and the embedding of science in our culture, become invisible. Science and engineering are intensely human activities, contributing towards understanding our world and addressing many of its severe problems. Highlighting these dimensions is likely to attract many more people to study science and participate in scientific activities. Yet the current discourse equates the arts with creativity and culture, not the sciences. The Olympics 2012 is currently a missed opportunity. Despite considerable efforts, no significant science dimension is visible in the cultural programme. The British Science Association experienced similar challenges when taking the Festival of Science to Liverpool as part of the Capital of Culture celebrations. There is a need for joint actions between DIUS and DCMS on science as a creative and cultural enterprise.

— Measures of success

The measurement of impact is a major challenge in this area, as it is in many aspects of social activity. The existing work by the Research Councils on economic impact, to take just one aspect, illustrates the difficulties. This work stream should take a pragmatic and realistic approach, recognising that programme evaluation well established in many places but overall societal impact is extremely difficult to define and measure in any causal manner. A more narrative evaluation, that examines what people feel as well as what they know and do, may be a way forward, in conjunction with quantitative representative surveys.

— Building on existing frameworks

We should recognise, celebrate and build on the many existing mechanisms that help bring coherence to the different aspects of this work, only developing new ones if there are clearly identified gaps from the creation of an overall Science in Society Framework. In effect, this is a cross-cutting theme which would be incorporated into all other work streams. Our existing mechanisms at a national level include, and there are undoubtedly others: Beacons for Public Engagement; ECSITE UK; National Science and Engineering Week; Science Festivals; Science Learning Centres; the Sciencewise Expert Resource Centre; STEMNET; and the UK Resource Centre for Women in Science, Engineering and Technology. There is a real willingness and energy within the public engagement community to work together. Most recently this is illustrated by the developing UK Young Scientist's and Engineers' Fair, now a large collaborative exercise which was originally instigated by the British Science Association with Young Engineers, and with initial support from the ETB.

18. The UK has a high international reputation in this field. The British Science Association believes that the ideas outlined above will enable the UK to continue to lead the way, and help improve public confidence in science and engineering policy.

January 2009

APPENDIX

THE BRITISH SCIENCE ASSOCIATION'S PROGRAMMES

We achieve our impact through four national programmes, in concert with the Regional and Branch network, and in partnership with a wide range of organisations.

— The Festival of Science takes place in a different university city each year. It brings together the best in science (including social science), engineering and technology to celebrate scientific advances, explore the latest developments and encourage open discussion about science-related issues that interest large numbers of people, directly and through huge media attention. The impacts of this, Europe's largest science festival, include massive national (and locally regional)

press coverage, event attendances of 50,000–130,000 depending on the venue, and legacy relationships or activity in the host area (for example many recent science festivals such as York, Cheltenham and Leicester are legacies of the Festival of Science or National Science Week).

— National Science and Engineering Week (NSEW) is a coordinated nationwide grassroots celebration and discussion of all aspects of science, engineering and technology through local, regional and national events. It is funded by the DIUS, orchestrated by the British Science Association and addresses varied public audiences, with a particular emphasis on young people and families. The impacts of NSEW, based in 2008 on some 3,500 events nationally and 1.4 million directly involved participants, in addition to huge local and regional media coverage, include the continued involvement of hundreds of event organisers in reaching their publics and the bringing in each year of new presenters and new audiences, building national capacity in public engagement and widening access.

— The CREST Award scheme is the only national accreditation scheme for project work in science, engineering and technology in the UK. The programme addresses young people between 11 and 19 and their teachers, and involves scientists and engineers as mentors. In 2007 CREST ★ Investigators was launched, extending the scheme from age five in primary schools. CREST is a major element in the "STEM enrichment" landscape, and the expertise we have developed through CREST and NSEW have led to our co-ordination of the Science and Engineering Clubs initiative, our involvement in the Directors for STEM enrichment schemes and in delivery of the National Science Competition. CREST is also a centrepiece of the UK Young Scientists' and Engineers' Fair, directly initiated by the British Science Association.

— The Science in Society programme both supports the science communication community and encourages members of the public to "have their say" in science-related matters that concern them. The programme operates through the annual Science Communication Conference and specific initiatives including Media Fellowships, Perspectives and the community x-change. The science communication conference is viewed as the major networking and updating event of the year.

— The UK network of Regions and Branches organises programmes for local audiences organised by volunteers. The Regional staff team supports the volunteers in Branches and promotes activity during National Science and Engineering Week, and is active in the networking of science communication activity in their region.

Memorandum 12

Submission from the CBI

Summary

— The CBI believes there is no need for a regional science policy—it should be a UK national policy, centrally coordinated and championed, but a new Department for Science is not required

— Science and engineering advice should be a core input to the formulation of policy across government, not just in science and engineering-specific areas. Social science expertise must also become more prominent in policy advice

— A conscious reassessment of public Research and Development (R&D) and technology funding is required to ensure the UK is well positioned to emerge strongly from the economic downturn

— Science and society policy must seek to influence people from an early age about the value of science, and government must play a more active part using social marketing and other techniques.

Background

1. As the UK's leading business organisation, the CBI speaks for some 240,000 businesses that together employ around a third of the private sector workforce, covering the full spectrum of business interests both by sector and by size. The CBI welcomes the opportunity to submit evidence to this inquiry on science and engineering policy. We also draw your attention to our more detailed submission to the committee's inquiry on engineering in May 2008—many of the issues we raised are still relevant.

2. Our response focuses on four themes within the call for evidence: the science and engineering policy landscape, science and engineering in policy formulation, science and society issues, and the Haldane Principle.

Science and Engineering Policy Landscape

3. The current science and engineering policy landscape in the UK is too fragmented across too many bodies. The fragments do not join up—or at least it is often not clear how they join up—and it is sometimes difficult to determine which organisation, group or individual has lead responsibility on different issues. The CBI believes this has to change. If the UK is to stay competitive internationally, through investment in the science and engineering skills and research base and effective use of science and engineering expertise in policy formulation, then the UK must have a strong and coherent science and engineering strategy. This strategy should be centrally coordinated and championed and the sum total must be greater than its constituent parts.

4. We do not see the need for science and engineering policy to change across regional boundaries within the UK. The regions and devolved administrations should act together to ensure the UK can build and maintain a critical mass of science and engineering activity. Instead of duplicating effort in different regions and spreading resources too thinly, the regions and central government should work together to define and deliver a single strategy.

5. Similarly, other key government-funded science and engineering policy stakeholders (eg the Research and Funding Councils, professional societies, delivery bodies and agencies) should work more closely together to identify synergies, address gaps and maximize impact. A key objective should be to slim down the current proliferation of policy effort so business, universities, public and third sector users of science and engineering can have greater confidence that the system will be responsive to their needs.

6. Science and engineering policy should not, however, be constrained within a separate Department for Science. DIUS should continue in its overall UK leadership role on science and engineering, but, working with the Government Office for Science and other key stakeholders, should act more as a champion of science and engineering in government and across the economy and society. This is a time to consolidate and focus on delivery, rather than deflecting effort by digging up the system to create additional structures.

7. Science and engineering are required across all aspects of government, and leadership is required in each area. Progress has been made in recent years by developing the role of the Chief Scientific Adviser and creating chief scientific adviser positions (sometimes with independent expert advisory committees in support) in most government departments and some key agencies. This system should continue to develop so that the chief scientists have direct involvement and influence over R&D spending and policy formulation and oversight of execution—this is not yet the case for all departments. Chief Engineer or Chief Technology Officer positions should also be considered, to ensure that departments and agencies have appropriate expertise in these areas and, in particular, so they can tap effectively into state of the art developments in business and academia.

8. We welcome the government's commitment in the *Innovation Nation* white paper to produce an annual innovation review. The first report (published in December 2008) provides a benchmark against which to judge progress in future years and this reporting should become a core part of the scrutiny process for innovation. Evidence of public procurement being used to catalyse business investment in innovation should be one of the key reporting measures. A similar approach should also be taken for reporting on and evaluating science and engineering. This could cover the government's approach to science and engineering investment (which may overlap with some of the innovation review reporting) and how it has used science and engineering advice and evidence in policy.

9. Incorporating an element of independent external review would make this an even more valuable exercise.

Policy Formulation

10. Increasing the number of qualified scientists and engineers in parliament and throughout the UK civil service, in particular in senior positions, would provide a more effective basis for policy making across government.

11. The views of the science and engineering communities should be included as a central component of all policy formulation, not just in the formulation of science and engineering policy. At present science and engineering involvement is marginal, typically on a case by case basis, and typically only where there are obvious science, engineering or R&D issues to address.

12. Scientists and engineers can bring the technical and practical expertise needed to judge the full depth and impact of decisions and may be in a position to suggest innovative solutions to intractable policy problems. Scientists and engineers also have particular expertise in modelling scenarios, which could prove invaluable in determining the sensitivity and resilience of policy to changes in relevant factors. In addition, they may be more willing to "think the unthinkable" and test policy assumptions and evidence to destruction "in the lab" before wider release.

13. It is important for social scientists to be included in the "scientists" category too as an increasing number of policy areas require solutions that have both technical and social dimensions. For example, influencing behaviour change is likely to be one of the most important components of policy in coming years

where effective social science input will be essential. Perhaps the most critical policy area for this will be in meeting our climate change obligations, where substantial, sustained and pervasive behaviour change is likely to be required, alongside major technological developments.

14. Greater use should be made of short-term appointments for scientists and engineers within government in order to attract the best minds and avoid stagnation. A model for this can be found in the US Defence Research Projects Agency (DARPA). It should become a normal ambition for high flying technologists to have had a 3–5 year engagement within government on their CV.

Haldane

15. The Haldane Principle has already evolved significantly since it was first set out in the 1918 Haldane Report on the *Machinery of Government*[28]. It is now interpreted to mean that decisions on what to research should be in the hands of researchers and made on scientific criteria, at arms' length from political considerations. The original Haldane Report made no such recommendation. Instead, it proposed a split in government funded research so that delivery departments would focus on specific forms of research of relevance to their work (eg in health, transport and defence etc), whereas general research[29] should be the responsibility of a separate organisation in government. The intention was to improve the provision of knowledge to underpin policy and free general research from departmental bias, while maintaining direct Ministerial control over research funding decisions.

16. The majority of public funding for research is now delivered at arm's length from central government through the Research and Funding Councils (c. £5.3 billion per year), with DIUS as the department ultimately responsible. Through the peer review and research assessment mechanisms, this "science and engineering base" funding is, by and large, controlled by the researchers themselves. The other delivery departments are responsible for c. £4.3 billion per year (£1.7 billion civil, £2.6 billion defence) of public research spending.

17. Within both the science and engineering base and delivery department streams, our concern now is less about departmental bias and political interference—although it is important to keep these under review—and more about the funding for different types of work within the R&D spectrum.

18. We strongly support the emphasis placed by the Technology Strategy Board and Research Councils on research to address major challenges facing the economy, society and environment, but recognise that pure curiosity-driven research also has a critical role to play. The question that needs to be asked is, has the right balance been struck between the two? Similarly, has the right balance been struck between funding for research versus funding for development ("R *vs*. D")? In both cases we say no.

19. Support for user-focused and challenge-led research *has* increased in recent years,[30] but the UK still lacks the mission-driven ethos that is prevalent in competitor countries such as the US, where DARPA, NASA and other agencies lead the way in engaging business and universities to find solutions to real world problems.

20. Public support at the "D" end of the R&D spectrum also needs to be improved. Civil department and agency funding for experimental and technological development as a proportion of overall public R&D spending is as much as six times higher in the US than it is in the UK.[31] It is in the development and demonstration phases of new technology that the highest costs arise—as research ideas are taken through to prototypes, validation, scale-up and readiness for market—and it is here where the UK must increase its investment to build a competitive advantage for the economy.

21. The government could also do much more to link development spending to public procurement, using its £175 billion per year purchasing power to help pull through innovation and catalyse further investment by business. There is widespread recognition of the need for this, but, in reality, little progress has been made. The government should "raise the bar" when producing tenders as an incentive for business to invest in building their capability—helping UK businesses compete internationally—and generating solutions that will find a wider market.

22. A conscious reassessment of public R&D and technology funding is now required to ensure the UK is well positioned to emerge strongly from the economic downturn. We recommend supporting the acceleration of technology development in the short and medium term, linked to major challenges and procurement opportunities, while ensuring that our investment in basic research remains world-leading.

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[28] Report of the Machinery of Government Committee, Ministry of Reconstruction, Cmd 9230, 1918. Also see discussion in HM Treasury paper, *Historical overview of government health research policy*, for the Cooksey Review, September 2006.

[29] The general research to which Haldane referred would now be called basic research.

[30] For example with the creation of the Technology Strategy Board. There is also a business research element in HEFCE's QR funding (although this is only £61 million out of £1.46 billion—and we argued in our follow-up to the Lambert Review that it should be £200 million per year) and RAE2008 appears to have given greater recognition to research excellence beyond that judged by academic peer review of academic publications.

[31] CBI analysis on R *vs*. D to be published in spring 2009.

Science and Society

23. Public engagement with, and confidence in, science and engineering is essential for the future of the UK economy and society. Engagement in the science and engineering policy debate is also important as new discoveries challenge our understanding and help to shape the future. We described business interest in these issues in our input to the recent DIUS consultation on science and society.[32]

24. To be effective, a new science and society strategy will require concerted action on three fronts: to improve the STEM[33] skills "supply chain", to bring a wider understanding of science and technology into everyday life, and to engage the public on key science and technology issues as they develop.

25. Engagement with science must start at an early age. It is important that school children are taught science by competent, appropriately qualified and enthusiastic teachers and for these teachers to have the science labs, materials and technical support they need to teach effectively. There should be a focus on practical experience, problem solving and understanding what happens in the "black boxes" of technology. The Digital Britain action plan provides a useful focus for stressing the importance of digital applications, as well as creativity, in a better-connected broadband world.

26. Careers advice must be improved dramatically to challenge misperceptions about science and engineering degrees and career prospects. Particular emphasis must be placed on encouraging girls and women into science and engineering education and careers to create a balanced workforce with the skills and experience required for the future. Continued effort is also needed to retain qualified women in science and engineering careers to address the disproportionate flow of women into other disciplines and out of the work force.

27. There has to be an end to the current state of affairs in which many school children, sections of society and some media presenters believe it is "cool to be thick" when it comes to science. The value of STEM to society and our way of life must be made more explicit—both in the curriculum and in everyday life. In our science and society submission, we proposed a campaign to provide scientific, technological and other information about products, processes and services at their point of use. This social marketing campaign should be wide-ranging and pervasive, primarily factual, but also designed to create debate. Public service broadcasting obligations should be used to catalyse change: ensuring that "bad science" can be de-bunked and making it unacceptable for presenters to condone a lack of STEM awareness.

28. Government should also take a lead on paving the way for future technology developments to be integrated into society. An in-depth and on-going public dialogue effort on key science-based challenges and new technologies is required, which the government will need to sponsor. This engagement should encourage informed public debate on risk and uncertainty, potential and impacts, priorities, choice and UK ambition. It must seek to build public trust and confidence, explore issues of concern and commit to addressing them.

29. Discussions should cover issues such as: stem cells and regenerative medicine; emerging diseases; what changes will be required for individuals to adapt to/mitigate climate change; and how far we should allow autonomous systems to take over from human control (eg in transportation, medical and other scenarios). The topics are likely to be controversial, but creating awareness and understanding early on will help to position the UK well to deal with future challenges. It may also help to seed demand for new products and services that will have knock-on benefits for the UK economy and society.

January 2009

Memorandum 13

Submission from BRE Global

Summary

— Science and engineering are so important to the success and well being of our nation that I recommend we have a Department of Science overseen by a committee chaired by the Prime Minister.

— Government needs an overarching strategy and associated policies for ensuring triple bottom line sustainability. This needs to be informed by proper scientific evidence rather than being driven by issues which can lead to waste and ineffective or damaging policy.

[32] CBI submission to the DIUS Science & Society consultation: http://www.cbi.org.uk/scienceandsociety
[33] STEM: Science, Technology, Engineering and Mathematics.

— Science at the academic level is well regarded and funded on a long term basis. The real gap comes in its application to Government policy where research is short term and carried out on a project by project basis frequently specified and managed by non-scientists across a range of Government Departments, regions and NPDBs. Delivery of Government science policy needs to be joined up rather than fragmented. This is particularly vital for science work associated with climate change, and the construction, management and maintenance of our National infrastructure.

— Better scientific education of the nation is essential to our success.

Question 1: *Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a department for Science.*

1.1 Although I have spent my entire career working in science—in academia, industry, Government and latterly as Chief Executive of a technical business which is part of a Charitable Trust, I see little evidence that science and engineering is really at the heart of Government policy and conclude that the Cabinet Sub-Committee and Council have been unsuccessful.

1.2 The nature of our democracy and the media is such that Government has a natural tendency to focus its attention on the political issues of the day—big or small—from light bulbs, unemployment, shops or diabetes through to taxation, climate change, health and safety, justice, trade and agriculture. This makes it very difficult to take account of the fact that actually most issues are inter-related and that we all live in a planetary ecosystem governed by the laws of physics, chemistry and biology. This system is essentially a closed system (other than the influx of solar radiation) with a finite capacity to cope with the demands the world's population makes on it. Unless we put real science (and also engineering, economics and ethics—hereinafter referred to just as science) at the heart of what we do then at some point, a combination of population and economic growth could mean that the demands for raw materials and energy will exceed the ability of nature to replenish them and also to absorb the resulting waste.

1.3 To put science and engineering at the heart of policy-making requires a real overarching Government strategy coupled with a coherent means of assessing and delivering the associated policies. Current fragmentation of policy and structural issues across Departments (discussed briefly below in response to other questions) make this very difficult. A related issue is that the Chief Scientist can end up being seen as a nuisance who interferes with Departments rather than as a leader who ensures effectiveness of science.

1.4 Science and engineering are so important to the success of our nation that I recommend we follow Norway's example and have a Department of Science overseen by a committee chaired by the Prime Minister. This would need to be underpinned by better science and mathematics education for everyone—we can't build a strong and triple bottom line sustainable economy on wishful thinking; Politicians willing to lead sustainable change will only get elected if people understand what really matters.

Question 2: *How Government formulates science and engineering policy (strengths and weaknesses of the current system)*

2.1 The science of climate change, energy security, health, education, construction and agriculture remains poorly understood and provokes intense debate, lobbying and positioning. The responsibilities for development and implementation of policies for them fall across a wide range of Government Departments, Regions, Local Authorities and NDPBs. Demarcation lines are sometimes unclear and/or ignored.

2.2 As a result of this fragmentation of policy responsibilities there is often insufficient money available to research the issues properly, identify options, establish which are best and then implement them. Duplication of effort, failures to learn from experience and omission of vital work become rife. Not only does this waste tax payers money directly, worse still, it can undermine science and the Government by leading to research to back up a policy rather than to inform it ("policy based evidence" rather than "evidence based policy").

2.3 We hope that the recent announcement of the formation of the Department for Energy and Climate Change will really bring together policy and its implementation in this important area—and bring much needed science to bear on the issues. A few illustrations of the effects of recent failures to bring science to the area of climate change made worse by fragmentation of responsibilities are given in an Annex below.

Question 3: *Whether the views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is addressed*

3.1 Science should be at the heart of what we do as a nation and it is surely the responsibility of Government to ensure that it is used to improve the long term safety, well-being and triple bottom line sustainability of the nation. The science and engineering community are a very important group that Government needs to listen to, but their inputs must be subject to proper scrutiny and peer review. As the infamous story of Millikan and the charge on the electron illustrates, even the best scientists can fool themselves.

3.2 Research councils should be "guardians of the independence of science" but as members are both recipients and distributors of grant money they are subject to conflicts of interest and this needs to be addressed.

3.3 In general, we are well served by our Universities who are able to carry out long term basic research. The real gap comes in the application to Government policy where research is short term and carried out on a project by project basis frequently specified and managed by non-scientists. As a consequence a lot of tax payers money is wasted—not just on poor research but on badly founded policy (see illustrative examples in the Annex). This situation has got considerably worse over the years. J B S Haldane (a relative of the Haldane who invented the principle) illustrated that the tendency of government to forget what they have already done is not new. J B S Haldane[34] when discussing coal-gas poisoning mentioned that research in 1899 by the Home Office showed that exchange of air in homes is chiefly through the walls; but that same Home Office issued guidance in 1938 concerning protecting your house against air raids, ignored this report, and instead concentrated on plugging gaps in windows and doors to protect against poison gas (and ignored completely the main danger from air raids—explosive bombs!)

3.4 A related matter is that the EU spends a lot of money on applied research to make the EU more competitive. We don't have any form of national strategy for exploiting it.

Question 4: *The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating*

4.1 Regional science policy is madness and just increases fragmentation, duplication and waste of tax payers money! See above. Science is expensive, hard work and can often be very long term and tedious. Regional science is already leading to low quality superficial work where we fail to learn the lessons from the current science and engineering community as well as from the past.

4.2 The Haldane principle needs to be updated for the 21st century. Researchers inevitably want more research. It is surely Government's role to set national priorities and policies informed and underpinned by science. Researchers can then identify solutions and options for implementing the policies and applied scientists and engineers from the Research and Technology Organisations and industry can help with their assessment and selection.

4.3 The new Haldane principle would then be that each of the primary Government policies should be informed by science and that each new problem or opportunity should be tackled by integrated and informed research designed to identify options for solving them. Implementation decisions for the policies should be subject to peer review (basic and applied), parliamentary scrutiny and assessments of cost effectiveness/value for money for the tax payer

Question 5: *Engaging the public and increasing public confidence in science and engineering policy*

5.1 Fragmentation of Government, "policy based evidence" and shortage of good science teachers has inevitably dented public confidence. There is no quick fix—we've got to address science, engineering and economic education at all levels.

Question 6: *The role of GO-Science, DIUS, and other Government Departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy*

6.1 The question again highlights the problem that there are too many bodies dispensing or chasing precious tax payers money, with the consequent fragmentation of policies and approaches. We should not be relying on charities such as the BRE Trust to fund work essential to the well being of the nation but should support them, the Universities and the RTOs.

Question 7: *How government science and engineering policy should be scrutinised.*

7.1 We consider that it is the role of Government to set high level national priorities and policies informed and underpinned by high standards of engineering, science and economic education and research. Scrutiny should surely be by Parliament with support from eminent scientists, engineers and economists who have minimal conflicts of interest?

[34] *"Science and Everyday Life"*—J B S Haldane FRS—1941.

Annex

A few illustrations of fairly recent failures in policy caused by lack of overall strategy and fragmentation — with particular reference to Climate change and energy security.

Whilst the new Department for Energy and Climate Change will bring together much of the climate change responsibilities previously with the Department for Environment, Food and Rural Affairs (Defra) and Department for Business, Enterprise and Regulatory Reform (BERR) it is likely that there will still be policy and implementation responsibilities within these and a range of other Departments including the Treasury, CLG, Department for Transport, DIUS, Department for Children, School and Families as well as Local Authorities and a range of other bodies including the Carbon Trust, EST and OFGEM.

There are lots of examples of how this fragmentation leads to poor value for money for tax payers but in the context of this inquiry I have identified a few recent examples for illustrative purposes only.

A1. *Facts or adjectives*

"A huge amount" of money is being spent on renewable energy! The problem is that renewable energy is usually mentioned in terms of adjectives rather than hard facts and numbers—for example "huge wind capacity", or "huge tidal energy". There is a distinct lack of hard facts and figures. David MacKay[35] is trying to rectify this. He examines our total energy usage in the UK and then tries to provide a similar amount of energy without using any oil or gas (which we would probably have to do to meet our 80% CO_2 reduction commitment). Amongst his conclusions are that even if we covered the windiest 10% of the country with wind turbines, we *might* be able to generate half of the energy used by driving a car 50km each day. He notes that Britain's onshore wind energy resource may be "huge", but not as "huge" as our huge consumption. And to put these numbers of wind turbines into perspective, they would represent fifty times the entire wind hardware of Denmark or double the entire existing capacity of the whole world. And yet again, government departments are encouraging them without much thought to the figures mentioned in David MacKay's book.

MacKay also mentions biofuels. If you set aside land for biofuel it cannot be used for agriculture—one of the reasons behind 2008's large rises in the price of food. He points out that once upon a time the human race generated nearly all its energy from biomass fuel, but that only worked with a middle-ages living standard and population. If *all* British land currently devoted to agriculture was used to grow biofuel, that would still only equate to about 36 kWh/day per person. (Current UK consumption is about 125 kWh/day per person.)

A.2. *Clean development mechanism*

Whilst the underlying intention and philosophy of the clean development mechanism is good, failure to recognise and understand the complexities of the science and economics in the context of the global systems has led to unintended but largely predictable consequences. Gwyn Prins and Steve Rayner[36] describe some of these, citing for example a probable increase in HCFC production in developing countries to take advantage of the CDM credit payments. Again we understand that attempts are being made to address this.

A.3. *Hospital closures*

Hospitals as places of healing should ideally be designed, built and managed on scientific principles across almost the entire range of disciplines. From how they are kept clean to prevent spread of infection through to selection and operation of the requisite range of diagnostic and treatment equipment. From ensuring that they are robust against some form of disaster through to providing comfort cost effectively.

Closing down small local hospitals and concentrating resources in large purpose built out of town ones was as I understand it designed to improve quality and speed of treatment although based on the experience in Hemel Hempstead the public view it as badly conceived cost saving. Inevitably this policy makes life more difficult for those who have to get there, as well as having implications for climate change associated with driving and public transport (and numerous other technical and social issues). This may well be the right thing, but as far as I can see there has been little real clarity in what Government wants to achieve, little learning from the mistakes of history and little cross disciplinary and cross departmental science to research and identify options to achieve the policy and assess which of these options give best value.

[35] *"Sustainable Energy- without the hot air"*—Professor David MacKay—Professor of Natural Philosophy, Department of Physics, University of Cambridge—2008.

[36] *"The Wrong Trousers—radically rethinking climate policy"*—Gwyn Prins and Steve Rayner—a joint discussion paper of the James Martin Institute for Science and Civilisation, University of Oxford, and the MacKinder Centre for the Study of Long-Wave Events, London School of Economics—2007.

A.4. *Micro-renewables*

Until research carried out for the BRE Trust[37] showed that micro-wind turbines might accelerate climate change (in addition to the initial embodied carbon and efficiency of the turbine, the payback period is highly sensitive to local wind conditions, transport costs, maintenance requirements and the life of the turbine) Government departments and some local authorities were widely encouraging their use. Government should check its facts and not rely on false claims and wishful thinking.

A.5. *Infrastructure*

Almost all of our nation's economic activities require buildings and other infrastructure. Construction contributes some 10% to GDP and buildings some 45% of carbon emissions. But unique amongst all major world Governments the UK does not even have a Minister for Construction let alone a department with a research budget. Given the importance of our infrastructure (including homes, other buildings, railways, road travel, air travel, sea travel, gas, electricity and water supply, sewage disposal, waste disposal and electronic infrastructure like telephones and Internet) to climate change and energy security as well as our well-being and competitiveness, we need this brought together coherently. All of these need science and engineering input to work correctly and safely.

A minor but related issue—the Government has its own OGC to lead on the Government estate but its recommendations are often ignored.

A.6. *Life cycle environmental impacts*

As an example, DEFRA are working on the life cycle environmental analysis of plasterboard (amongst other things). But this work has already been completed to a large extent—and not just for plasterboard, but for a whole range of construction products. *The Green Guide to Specification*[38] provides guidance on the relative environmental impacts of over 250 elemental specifications for roofs, walls and floors etc. The methodology was developed by the BRE Trust Group with partial funding from the then DETR and support from a wide range of construction manufacturing trade associations co-ordinated by the Construction Products Association.

January 2009

Memorandum 14

Submission from the Institute of Physics (IoP)

Summary of Key Points

- It is difficult to ascertain the effectiveness of the CST, partly because its work is not clearly visible to the science and engineering community. The Cabinet Sub-Committee is a relatively new body, so it is too early to offer comment on it.
- A disadvantage of creating a Department for Science would be the potential loss of the CSAs which would have the effect of decoupling science policy from decisions made in other departments which risks making science a distinct and self-contained activity within policy.
- Instead of a Department for Science, to strengthen science in government, the departmental CSA principle should be built on
- There are low levels of science-trained people employed in higher levels of government, and this has an impact on the government's ability to formulate science policy.
- It is imperative that the government engages with the learned societies and professional bodies when seeking advice on science and engineering issues.
- The Institute supports the Haldane Principle that decisions should be taken on scientific merit free from political and administrative pressures. There is a strong case for expanding on the Haldane Principle in light of the money and authority now held by the devolved governments and the RDAs.

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[37] *"Micro-wind turbines in urban environments—an assessment"*—R Phillips, P Blackmore, J Anderson, M Clift, A Aguilo-Rullan and S Pester—2007.
[38] *"Green Guide to Specification",* 4th Edition—Jane Anderson, David Shiers—2009.

— The learned societies and professional bodies have an important role to play in countering the lack of public trust and confidence in science and engineering by providing scientific advice which is clearly independent and objective.

— Regarding the RDAs, scientific expertise is increasing at the centre of regional decision-making bodies but further progress could be made—there remains a perception that some RDAs are not as engaged with science as they should be.

Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science

1. Regarding the Council for Science and Technology (CST), it is often difficult to ascertain its effectiveness, partly because its work is not clearly visible to the science and engineering community. Because the CST has low visibility externally, its actual role, as distinct from its remit, is often unclear. It is also not clear how it avoids duplication with what other bodies are doing. Indeed there is overlap, but the CST is in the unique position of providing information directly to the Prime Minister. The CST needs to foster closer links with other bodies, which will certainly support it in the provision of information and avoid duplication of effort.

2. The Cabinet Sub-Committee is a relatively new body, so it is too early to offer comment on it. However, it is odd that on its website[39] it is stated that the Government Chief Scientific Advisor (GCSA) may be invited to attend meetings. The GCSA heads the Government Office for Science (GO-Science) which "co-ordinates and develops good practice on how Government should seek and use scientific advice in policy making … " and is a champion of "Science in Government", which is an initiative working to improve the quality and use of science and technology across government. Therefore, it is imperative that the GCSA is *expected* to attend the meetings, particularly as the GCSA's role is independent to the ministers of the various departments.

3. The introduction of departmental Chief Scientific Advisers (CSAs) a few years ago was very welcome and has proved effective in some areas at bringing science to the forefront of policy development. The CSAs reflect the reach of science, and keep it in the minds of all ministers and departments, rather than just one. It is evident that in some departments the CSA has direct involvement and influence in policy formulation and oversight of execution; this is not yet the case for all departments.

4. It is worth noting that there are no CSAs in Northern Ireland or Wales. In Wales, we understand that the First Minister is considering a report on the role of a CSA for Wales. It is crucial that an appointment of a CSA is made in particular to bring science and engineering to the forefront of government policy in Wales. In Northern Ireland, we urge that an appointment of a CSA is made in particular to drive forward the implementation of the recommendations of the STEM Review, which we understand is still being undertaken.[40]

5. As for the question of whether there should be a Department for Science, such a proposal was mooted before the creation of DIUS and there was much discussion amongst the science and engineering community on this issue. DIUS is itself a relatively new department, and the transition from the amalgamation of the relevant functions of the former DTI and DfES has been smooth; the Institute is of the view that it is highly unlikely for there to be another reorganisation, particularly as the recent Cabinet Office Capability Review[41] reported that DIUS has made a strong start to its first 18 months in operation and is " … well placed to realise the benefit of bringing together government investment in skills, innovation and publicly sponsored science and research in support of better economic and social well-being."

6. A disadvantage of creating a Department for Science would be the potential loss of the CSAs which would have the effect of decoupling science policy from decisions made in other departments which risks making science a distinct and self-contained activity within policy. This could result in science becoming isolated, even neglected, in policy decisions, particularly from education and the innovation and business support mechanisms within DIUS, which could result in an unnecessary competition for resources. Instead of a Department for Science, to strengthen science in government, the departmental CSA principle should be built on. More people with science backgrounds should be found in the policy units of government departments, either through an expansion of the offices of the CSAs, or preferably, the incorporation of science-trained workers in each departmental policy unit.

[39] www.cabinetoffice.gov.uk/secretariats/committees/edsi.aspx
[40] www.delni.gov.uk/index/successthroughskills/stem-rev.htm
[41] http://nds.coi.gov.uk/environment/fullDetail.asp?ReleaseID=387228&NewsAreaID=2&NavigatedFromDepartment=False

How Government formulates science and engineering policy (strengths and weaknesses of the current system)

7. A weakness of the current system is that there are low levels of science-trained people employed in higher levels of government, and this has an impact on the government's ability to formulate science policy.

8. In part due to this, and to the decline of the National Laboratories, academics and commercial consultants are increasingly used as advisers to government on areas of science, and are considered as independent advisers. In the absence of an opportunity to strengthen and expand the government's science facilities, the funding streams for scientists used by government should be acknowledged to prevent accusations of bias. The American DARPA model incorporates a secondment programme for increasing the number of science-trained people in government. A similar programme could be considered in the UK.

9. In addition, the introduction of a STEM stream within the Civil Service could be considered. Within this, it would be very important that the entry requirements for graduates entering the stream were high to ensure quality (as with other specialist streams). The training for staff in the stream would include a significant element of economics, statistics and the social sciences—these are the core skills for evidence-based policy-making in government, and staff would build on their existing high levels of scientific training.

10. We note that the Chief Scientific Adviser's Committee (CSAC) is the principal committee at official level dealing with issues relating to science, engineering and technology. Its membership consists of the GCSA, and the CSAs or their equivalent from all government departments and devolved administrations. Once again, looking from the outside in, it is difficult for us to make quantifiable statements as to the effectiveness of the CSAC in formulating government policy, particularly as we have little or no interaction with the GCSA and/or the departmental CSAs, unless we actively approach them on an issue of concern/interest. The former House of Commons Science and Technology Committee in its inquiry report, *"Scientific Advice, Risk and Evidence Base Policy Making"*, made several recommendations on how the work and effectiveness of the GCSA and the departmental CSAs could be improved, particularly their interactions with civil servants, scientists and learned societies and professional bodies. On the latter, the Committee reported that it " … found scope for greater involvement of the learned societies and professional bodies in the UK scientific advisory system, not least in order to reduce dependence upon external consultants." To date we have not experienced any change (ie greater level of engagement) in our interactions with the government on matters of science policy.

11. In addition, the government has published its *"Guidelines on Scientific Analysis in Policy Making"* which address how " … evidence should be sought and applied to enhance the ability of government decision makers to make better-informed decisions." The guidelines are regularly issued for public consultation by the GCSA, something which is to be lauded.

12. Reflecting on the guidelines which were last updated in 2005 following consultation, we note, on the same theme, that government departments are encouraged to engage with a wide variety of scientific learned societies and professional bodies when seeking specialist advice. We feel that this is imperative as the learned societies and professional bodies, such as the Institute, have access to a significant number of members who have a wealth of experience on a variety of scientific-based issues. Their input will undoubtedly supplement advice received from other, more traditional sources. An obvious benefit in using "independent" scientific learned societies and professional bodies to offer their opinions on important issues is that the general public may be more inclined to believe them than the government.

13. Overall, the guidelines appear to be predicated on the assumption that it is straightforward to define the "issues" that need scientific advice, to determine the "best source" for finding that advice and what is likely to impact upon policy making.

Such decisions themselves involve expertise. There is often no consensus on where the "best" advice may reside and which policies may be affected. Very often, these decisions are taken by civil servants within government departments. Although they have a responsibility to be neutral and unbiased, they may still have pressures that could affect the judgments that they are making.

Whether the views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is assessed

14. The views of the science and engineering community should be included at the centre of policy formulation, as they will have the necessary technical expertise to judge the full depth and impact of decisions. As stated in the previous section, this is something the government's own guidelines recommend and it is something that the scientific and engineering learned societies and professional bodies are keen to be involved in as part of their remit of representing the views of their members.

15. As a learned society and professional body, the Institute's main input in determining the UK's science and engineering policy is via responding to consultation documents that are issued by government departments. Representing over 36,000 members, the Institute is in a strong position to provide advice on matters relating to science and engineering policy, obviously with a strong emphasis on physics.

16. However, the main concern we have regarding consultations is that quite often we feel that policy makers are simply going through the motions and that consultations sometimes take place at a relatively advanced stage of the decision making process.

17. A good example of this was the government's *"Science and innovation investment framework 2004–14: next steps"* consultation which proposed amongst other things, to merge the Council for the Central Laboratory of the Research Councils (CCLRC) with the Particle Physics and Astronomy Research Council (PPARC) to form the Science and Technology Facilities Council (STFC). Another example was the former DfES's consultation on the "Reform of Higher Education Research Assessment and Funding" which proposed to replace the peer-reviewed Research Assessment Exercise (RAE) with a metrics-based measure of research assessment. In response to both of these consultations, the Institute engaged its membership and submitted responses; but the feeling throughout the process was that decisions had already been taken. We would have liked to have been involved in the decision-making process that informed both of these important step changes in the research base at an earlier stage, where our concerns and comments would have had more impact and relevance.

18. In addition to consultations, which are still the best and most considered approach to requesting input to inform policy making, the Institute would welcome more public meetings, such as those that were organised by BERR for the "Future of Nuclear Power: The role of nuclear power in a low carbon economy" consultation. Most importantly, these meetings (often regional) enable the general public, in addition to the usual stakeholders, to discuss pertinent issues. The aforementioned consultation is an example of an issue of wider public and national importance, whereas issues such as those affecting the science or research base will be of more limited interest. Nonetheless, the Institute would welcome the opportunity to attend either public or private meetings to offer its expertise on relevant issues. Indeed, it may be appropriate to hold private meetings at an earlier stage in the development process, when the objective/remit of a consultation is still being defined.

The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating

19. The Haldane Principle has recently come to the fore as a result of the STFC financial situation, where there were doubts as to whether decisions, such as those pertaining to the future of the Daresbury Laboratory, were made by research council officials based on independent scientific advice or were influenced by ministerial intervention.

20. The RCUK Review of UK Physics[42] reported that at the highest level the Haldane Principle is working effectively but not so in terms of developing regional policy, where there are potential conflicts of issues with regards to the siting of large-scale facilities. The Review recommended that DIUS and BERR should consider a restatement of the Haldane Principle, but the RCUK response to the recommendation instead reiterated the existing remit of the Principle without adequately addressing the regional issue.

21. The Institute supports the Haldane Principle that decisions should be taken on scientific merit free from political and administrative pressures. There is a strong case for expanding on the Haldane Principle in light of the money and authority now held by the devolved governments and the Regional Development Agencies (RDAs). It is almost universally embraced that university research funding should be driven by the quality of the science and coordinated through the research councils. However, we believe that there is currently a question mark over the effectiveness of the Haldane Principle in insulating this funding from government directions, and particularly the role of the RDAs in this area.

22. At a recent meeting organised by the Foundation for Science and Technology[43] on the RCUK Review of UK Physics, co-sponsored by the Institute, there was some discussion on this issue, where it was suggested by members of the audience that it should be left to politicians to resolve such conflicts and not scientists and that the research councils should think in national, not regional, terms. However, it was also suggested that the research councils should be aware of the resources in different regions that the RDAs have which can be allocated to sustain research activity. The Institute is of the view that this is an issue that clearly needs further investigation and would be keen to work with other science and engineering learned societies and professional bodies, and perhaps even the IUSS Committee, in organising an event to debate the Haldane Principle in greater depth.

23. In terms of the impact of the Principle on both large-scale facilities and regional and local research capabilities, we note that there is an apparent "social engineering" agenda in some aspects of regional development policy. The aim of this is to bring all regions to the same level and encourage inter-regional competition, which ignores the realities of the larger and more relevant competitions between the UK and the rest of the world. There is clearly a lack of coherence in regional policy, which is exacerbated by the duplication of effort between the RDAs and the sub-regional and national bodies.

24. To be able to truly compete on a global scale, the science and enterprise strategies of the RDAs should build on existing regional strengths and capabilities rather than attempting to capitalise on the next big thing and try to create a successful sector from scratch. To this end the RDAs should leverage their funding to support programmes which have both regional and national importance and the Technology Strategy Board should drive this strategy in parallel with the research council-driven agenda.

[42] www.rcuk.ac.uk/news/081001.htm
[43] www.foundation.org.uk

Engaging the public and increasing public confidence in science and engineering policy

25. The learned societies and professional bodies have an important role to play in countering the lack of public trust and confidence in science and engineering by providing scientific advice which is clearly independent and objective.

26. DIUS recently undertook a public consultation on its vision for Science and Society[44] and we hope that the input from the science and engineering community will help shape a vision that fosters greater public trust and engagement in ever more increasingly complex, but critical issues, such as energy security and climate change.

27. One of the questions in the consultation asked how policy makers can better engage with society about the development of science. The Institute is of the view that the best way to engage will depend on the individual objectives of the activity. Representation of policy makers on boards of Knowledge Transfer Networks and other research-industry networks would be one approach. Another would be "citizen" representatives on Scientific Advisory Committees, which can sometimes work well. In other instances proactive public consultation methods are needed. Many consultations are not accessible to non-specialists, so where their input is needed differentiation in consultation processes will be required, with appropriate publicity, to ensure that all parties can have a meaningful engagement. There are bodies with expertise in public dialogue methods, such as the Consultation Institute, and policy makers should make use of these. Policy makers also need to be explicit about the extent to which they will make use of contributions.

28. In terms of improving the trust in and respect for science and engineering, the Institute is of the view that the relationship between science and society requires the three communities—scientists, parliament and the wider public—to interact together on a basis of mutual understanding. Recent policy decisions concerning issues such as BSE, GM foods, mobile phones and nuclear waste, have illustrated shortcomings in this interaction.

29. In particular, the media has an important role to play here. For instance, the newspapers are currently awash with "climate disaster stories", where there is no dearth of opinion from all and sundry about future climate change scenarios and more worryingly whether the science that backs these scenarios is robust. Fewer, but official statements from reliable sources, such as government departments and agencies, would be of help. This is not a suggestion to stifle debate, which can continue through relevant avenues, but a request that bad science, or unproven theories are not provided the media coverage they do not warrant.

30. What we need to do is find ways of raising awareness among the public of what science is and how it is undertaken, the importance of risk and quantitative decision making, what refereeing means (ie the importance of exposing ideas to criticism), how to read media reports critically (eg sample sizes, etc.) so that the public have the tools to be able to identify good or bad science themselves.

31. Some arms of the media, particularly the scientific, technological and medical specialists, in the main deal professionally and competently with the majority of topics.

32. Even though the House of Lords Science and Technology Committee, in its report *"Science and Society"*[45] published in 2000, concluded against the adoption of a Code of Practice to ensure that the media reports scientific matters accurately where any breaches could be referred to the Press Complaints Commission, the IUSS Committee may wish to ascertain through the course of its inquiry whether the House of Lords Committee's conclusion needs to be challenged and if so, how an appropriate Code could be developed and implemented.

The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy

33. These organisations must be equally involved in policy making, alongside expert scientists and engineers. As a learned society and professional body, our main input in determining the UK's science and engineering policy is via responding to consultation documents that are issued by government departments. But there are other measures in place that can enable scientists and engineers better to interact with civil servants and policy makers.

34. Parliamentary bodies such as the Select Committees engage very effectively with the science community already, regularly visiting scientific establishments and inviting evidence from scientists. Learned societies and professional bodies have a role to play in providing briefing material for policy makers, or facilitating meetings between ministers and relevant leading scientists.

35. Regarding the RDAs, scientific expertise is increasing at the centre of regional decision-making bodies but further progress could be made—there remains a perception that some RDAs are not as engaged with science as they should be. The recent OECD analysis of innovation in the north of England[46] highlighted a number of areas of concern, including duplication of effort, and also the lack of expertise in RDAs when it comes to setting enterprise strategies suited to science-based industries.

[44] http://interactive.dius.gov.uk/scienceandsociety/site
[45] www.parliament.the-stationery-office.co.uk/pa/ld199900/ldselect/ldsctech/38/3802.htm
[46] OECD Reviews of Regional Innovation: North of England, United Kingdom, OECD Publishing 2008.

36. GO-Science needs to develop a clearer strategy and focus for its own work, which includes the need to become more proactive, and shaping the debate across Whitehall rather than simply responding reactively to a plethora of disparate issues.

How government science and engineering policy should be scrutinised

37. The Institute is of the view that the Select Committees of both Houses play a crucial role in scrutinising the work of government departments, which includes science and engineering policy. However, we are concerned that the creation of the House of Commons IUSS Committee as a replacement of the former Science and Technology Committee means that the key science and engineering policies of DIUS and other government departments may not be covered so thoroughly (even though the addition of "Science" to "IUS" has been a positive development). The remit of the new Committee is broader with the creation of DIUS, which includes higher education, etc., and it does not have a cross-cutting role to scrutinise other government departments, as it has a structure which more directly parallels DIUS. Although a significant proportion of the government's science-related programmes are now concentrated in DIUS, there is no doubt that such programmes will also continue to be important elements of other departments' responsibilities. In environment, energy, health, agriculture, and transport policies, science and engineering continue to play a key role.

January 2009

Memorandum 15

Submission from Concatenation Science Communication

1. As someone who has worked with various learned societies for a number of years, and who is currently engaged in a number of science communication ventures, I am pleased to be able to respond to this consultation. Alas, timing has prevented a more considered contribution.

Summary

2. The current Government has over a the best part of a decade restored science investment lost in the decade up to the 1998–9 financial year. This is appreciated and is to the benefit of UK PLC.

3. However science is still not fully effectively recognised in the policy-making process and is on occasion actively ignored. Nor is it strongly represented and coordinated across all Government Departments. Furthermore it is no longer as effectively monitored as it might by all-party Parliamentarian groups with the loss of the House of Commons Select Committee for Science & Technology. This committee needs to be restored.

Specific Questions Addressed

Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science

4. This question can be interpreted a number of ways: I will take it literally. The Cabinet Sub-Committee on Science and Innovation and the Council of Science & Technology do not have the remit, and therefore are unable, to put science & engineering at the heart of Governmental policy-making.

5. There are many issues in public policy that are underpinned by science. Failing to recognise, hence act on, underpinning science is a failure to put science & engineering at the heart of policy-making. Science can assist with policy relating to issues on the political agenda such as climate change impacts, biodiversity conservation, agricultural production, diseases and health concerns, energy issues, *etc*, *etc*. However scientists across disciplines can also help with regards to other public agenda concerns.

6. For example all scientists generally handle data and are aware of the problems: with data-set resolution reflecting biometrics be they of an individual whole-organism or a sub-population; of data substitution; of data loss; and of data interpretation. All of these affect issues such as the use of genetic fingerprinting as a forensic tool as well as biometrics for identity cards.

7. Another example concerns the way the recent credit crunch has been handled. It has long been accepted by both Parliamentarians from both sides of the House that the UK needs to become more environmentally sustainable and this is also agreed by the scientific community as a whole (see the *"Charter for Science & Engineering"* launched at Parliamentary Science Links Day 2001). However getting from where we are to a more sustainable society faces a number of obstacles. Consequently, in 2008, when it was announced that there were to be financial incentives to help re-boot the economy it was a missed opportunity that the sustainability option was ignored. Now, there are many ways that this might have been tackled and I cite the following for illustrative purposes only and not as a firm statement of personal policy. One option might

have been instead of a marginal VAT cut to have used the same financial value in investing in local government energy conservation schemes whereby local government awarded (and monitored) grants to ratepayers for domestic energy efficiency measures. This would have had the multiple benefits of: stimulating the grass roots construction industry; improving the actual value of property; as well as having a lasting benefit of making the UK more sustainable in the longer-term. Yet despite both political rhetoric regarding sustainability and the support for sustainability policy concerns across scientific sectors, such options were not considered.

8. Indeed Cabinet Sub-Committee on Science and Innovation and the Council of Science & Technology do not appear to have any significant say on such broader public issues. They are more concerned with science investment and assessment matters. Consequently science and engineering cannot be said to be at the heart of, or underpin, Government policy.

9. As to whether there should be a Ministry of Science then the answer is a very clear "no"! Science cuts across *all* of society and the economy and technology (that springs from science) increasingly so. Science therefore needs not only to have its research interests looked after in a coordinated way but also be applied, or underpin policy, across *all* policy-making sectors in a co-ordinated way. The best place for science and technology is (as it once was) is within the Cabinet Office but run by a senior ranking Minister where it can have the authority when dealing with issues across various Government Departments.

How Government formulates science and engineering policy (strengths and weaknesses of the current system)

Strengths:-

10. Overall Govt investment levels in science have caught up with the past lost ground period (that was prior to 1998–9) and we are well-placed to move ahead (provided this momentum is not lost given current competing UK credit crunch concerns).

11. Govt policy has not impeded UK science having higher impact *per* £ spent compared with most G12 competitors.

Weaknesses:-

12. Science is over-monitored. Much public funded research is effectively appraised twice: once on project application to funder, and periodically on university departmental outcome through REAs (or its successor). Conversely applied research (not Governmentally funded but often carried out by universities when outside of industry) is not properly recognised by Government and its Agencies. For instance environmental science research did very badly in the 2001 RAE. (A specific example here is that the ecological and land-management work of Herts U. which I understand had significant funding from outside of the Science Base was not properly recognised in the 2001 RAE: it had previously been successful in attracting non-Governmental funding but the poor RAE score made it harder (though fortunately not impossible) for the university to attract subsequent non-Governmental investment.) Then again, turning away from Government funded research, much industrial research necessitates safety testing or trials (again a form of monitoring) before being implemented (or going to market) and this can eat into patent lifetime and other private value (in the economic sense). Other countries are less strict. If the UK is to retain industrial research then industry and commerce must feel that it can function in a competitive way with research in other nations. This means that though standards must be maintained, such maintenance must not impede research. A biological instance is animal licence holder work which involves considerable bureaucracy with little if any added value to the high animal welfare standards found in the UK compared to other nations.

13. Science and engineering is not valued (in the political and social sense) in broader policy making issues of UK. This seems at odds with overall policy goals of both the Government and its opposition given that UK is an increasingly technologically-based society whose politicians seek (we are told) it to be underpinned by an increasingly knowledge-based economy.

14. Both the above mean that science and engineering is not contributing to the UK as it might and that the UK is not fully reaping the benefits of its science and technology expertise.

15. The structure and integrity of the UK science and technology sectors are being eroded. There seems to be a lack of appreciation by many policy-stakeholder parties as to how distinct different types of research truly are from each other and who should invest in them. These include:-

- blue skies research (dependent on Research Councils' investment)
- fundamental and basic research (Research Councils' investment)
- policy-driven research (Government Department and their Agencies' investments)
- applied basic research (Government Departments' and industry investments)
- applied near-market research (Industry and Commerce investments)

16. For example, while it is perfectly fine for Government Departments to invest in policy-driven research and then to contract this to Research Councils, there is increasing pressure for Research Council's to invest their own resources into what are in fact Departmental policy-driven research issues including those of technology-transfer.

Whether the views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is assessed

17. The views of the science and engineering community should be central to the formulation of Government policy. However the way the majority of consultations are conducted (using the Cabinet Office Guidelines as the official standard) demonstrates that policy makers do not really value science unless there is a very specific scientific question needing to be addressed necessitating specific technical knowledge. Transferable science skills to the broader social arena are not valued (see earlier examples).

18. It would be useful to have not just the outcome of a consultation assessed against the overall evidence submitted but also that the outcome is assessed against evidence received specifically from the independent scientific community (this includes learned societies). Then it would be more easily possible to see whether the science views had been considered.

The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating

19. The Haldane principle does not need updating but it does need re-affirming. Government Departments seem to be having an increasing number their policy-driven research questions answered by investment from Research Councils and not Departments and their Agencies. For example Research Councils seem to be including technology transfer in their strategies when in fact such research should be invested in by the Government Department responsible for business and enterprise. (This is robbing Peter to pay Paul.) (See also the letter in *Nature* from Stephen Moss 17th July 2008. (*Nature* vol 454, p274.))

Engaging the public and increasing public confidence in science and engineering policy

20. Public confidence in science and engineering cannot be improved until Government Departments and Agencies demonstrably appreciate (through investment and action) that they themselves have confidence in science and engineering. At the moment science and engineering concerns are not managed and addressed in a co-ordinated way across Government as they might. For example not all Government Departments have as a strong recognition of the value of science. Here for instance there is the Department for Culture, Media and Sports which seems to be slow in developing its own effective science resources. This lack of DCMS value percolates through to its related agencies. For example Ofcom does not seem to value science and has publicly distanced itself from science (see its ruling on the Channel 4 *"Great Global Warming Swindle" case in which it said that it was not in a position to assess programmes'* science accuracy or consider possible science misrepresentation). This means that the public has no media watchdog protecting it from popular cultural misrepresentation of science. Given this one example alone (especially one relating to the media which is fundamental to influencing public perceptions) it is hardly surprising that there is a need to increasingly engage the public with, and increase its confidence in, science and engineering.

The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy

21. The problem at the moment is that there is no clear-cut, overarching management of science policy across Government and so issues can and do fall between the cracks. These include both specialist issues (for example of concern to specialist disciplines) and generic ones (of concern to most scientists).

22. An example of the latter might be the actual and perceived value (hence utility) of a reasonably good science BSc to a prospective undergraduate: science career concerns have been passed from pillar to post despite much political rhetoric over the past three decades.

23. An example of a specific concern to ecologists falling between the cracks is that of systematics. Here the issue, despite three Select enquiries over the past quarter of a century, has fallen between education agencies and Government Departmental stools with nobody charged to take ownership of implementing the solution.

24. Another instance indicating that science policy issues are not being resolved, and so return again and again without being addressed, was that this "non-resolution returning" concern cropped up on three occasions during last year's DEFRA Science Advisory public meeting!

25. Because of this fundamental lack of tactical management, simply re-arranging the relationship between deckchairs— GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders—will have far from maximum effect.

How government science and engineering policy should be scrutinised

26. It needs a Select Committee. It is hugely regrettably that the House of Commons Committee for Science & Technology was disbanded and an anathema given the UK has an increasing technologically-based society whose politicians seek (we are told) it to be underpinned by an increasingly knowledge-based economy. If UK politicians of both parties truly seek the UK to develop a knowledge-based economy and for the nation able to develop and produce high-technology products and services, as well as to consume the same, and for knowledge and knowledge-based activities to pervade society, then the nation needs a Commons Select Committee with a specific focus on science and technology that scrutinises it across *all* of Government.

Conclusion

27. Investment in UK science has recovered much lost ground from before 1998–9 and Government funded science research is strong. However support for policy driven Departmental and Agency work has not benefited as much and industrially funded research does not have the supportive framework it might. This is in no small part due to science both not being effectively valued across Government Departments and not being actively managed across Government. Re-locating science back within the Cabinet Office, and being actively led by a senior ranking Minister, would be a start. Ensuring that science and engineering is properly scrutinised by restoring the House of Commons Committee for Science & Technology would also be a fundamental move.

About the respondent

28. Jonathan Cowie is based near Leicester and has been involved in science communication in the broadest sense for a few decades. For many years he worked for UK learned (biological) societies. More recently his ventures have come under an umbrella called "Concatenation Science Communication" http://www.science-com.concatenation.org. Because of this history it has been a pleasure to submit this response with the only regret that lack of time within the consultation window prevented a more in-depth consideration.

January 2009

Memorandum 16

Submission from UK Deans of Science

1. The UK Deans of Science welcome this particular inquiry by the Innovation, Universities, Science and Skills Committee and wish to make some brief comments on some of the issues it raises.

2. The UK Deans of Science (UKDS) has members in around 70 HE institutions that have significant science portfolios. Our primary aim is to ensure the health of the science base of the UK through the promotion and support of science and scientists and of science research and science teaching in the UK's HEIs.

3. In summary we would wish to make the following points, which are further developed and explained in later paragraphs. We urge the Committee to take particular note of those bullet points that are presented bold.

- We wish to record our thanks for the very significant financial and other support for science given by the Government over the past ten years. We are delighted that the Science Minister now has a seat in the Cabinet (paragraph 4 below)
- For a number of reasons the time has come for the creation of a separate Department for Science within the Government(paragraphs 5 and 6)
- New ways need to be found for obtaining the views of the science and engineering community that reach a wider group than has frequently been the case in the past (paragraph 7)
- We would advise against increasing the powers of RDAs to develop regional science policies. While there may be strong arguments in favour of further support for regional science activities any funding should not come from current national science budgets (paragraph 8)
- National discussion of the Haldane Principle should be initiated (paragraph 9)
- There needs to be further recognition of the contribution that the scientific process, "way of thinking" and method of approach, can make to society (paragraph 10)
- A Committee similar to the previous Science and Technology Select Committee should be re-formed to ensure full and proper Parliamentary scrutiny of science issues (paragraph 11)

— Steps need to be taken to ensure substantial increases in the number of members of the House of Commons and the House of Lords who have science or engineering qualifications (paragraph 12)

— The number of scientists and engineers in the civil service in each Government Department should be reviewed and strategies adopted to ensure significant increases in all Departments through appropriate changes to recruitment policies (paragraph 12)

4. Firstly, we should point out that our comments should be seen in the light of our view of the Government's track record in supporting the science base over the past ten or so years. We would wish to record that we recognise the priority that the Government has given to science, engineering, technology and mathematics—in bringing them into the mainstream of Government, prioritising them in several public spending rounds, and ensuring that all Government Departments give consideration to science when developing their individual strategies. The major real term increases in capital and revenue funding for science in higher education has transformed the potential of the UK's science base. This has, of course, helped to indicate just how far the UK could progress in science and innovation if the right policies, structures and parliamentary processes are followed in the future. In this respect the decision that the Science Minister attends the Cabinet is particularly welcome.

5. The Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology have the potential to bring science and engineering further into the centre of Government thinking. However, the requirement to consider matters relating to science and innovation and to report to the Committee on Economic Development suggests that there may now be an over emphasis on science in terms of its potential for economic impact. We find it very odd that, as we understand it, the Chief Scientific Advisor is not a permanent member of the Cabinet Sub-Committee but may attend only by invitation. Our members consider that our universities' science research and development must deliver solutions to the many local and global challenges and give the UK a major economic competitive edge. However, there is much more to scientific innovation than that which can be instantly measured by economic return (for example, inventions that may take considerable time to turn into products, outputs from curiosity-driven research that may not have an instant application, various improvements in treatment of disease, etc). It is for this reason that UKDS would wish to see the current combination of (economic) innovation, with universities, science and skills changed by the creation of a separate Department for Science within which there could be further consideration of the appropriate balance between applied and curiosity-driven research.

6. There are further arguments for the creation of a separate Department for Science. The open-minded way that the Government has continually considered, developed and refined its science strategies and policies has begun to illustrate just how far science can offer solutions to the challenges facing almost every Department of State. This means that each Department needs to consider how it uses and supports the science base so that science and engineering policy is in danger of being developed in an ad hoc way across the whole of Government with no central focus and coordination. It also means that there is no single place where the more fundamental and holistic issues relating to UK science and can be fully considered and taken forward.

7. The views of the science and engineering community must be taken into account when science policy is formulated. We offer no magic bullet to show how this can best be achieved. There has often been a tendency to rely on the same "great and good" individuals and organisations that, perhaps, can be relatively conservative in outlook and lacking in more forward thinking. Such reliance on the great and good also tends to ensure that the views of the most radical thinkers, younger scientists and some minority groups are not heard. It is important that a full range of individuals and organisations are offered the opportunity for engagement in the development of policy. Whilst Governement calls for comment can be helpful, we believe that rolling programmes of meetings with a wide range of individual scientists and engineers, with relatively open agendas, and where the participants can be confident that the consultation is genuine and that decisions have not already been made, could offer a way forward. Such an approach would certainly be preferable to commissioning one individual or organisation to produce, by consultation with a handful of others, a document that effectively becomes policy on its publication date. Of course, following the fuller consultative process that we suggest would mean that the Government (not the permanent civil service staff) would have to weigh up the outcomes and make final decisions on the way it wished to move forward.

8. UKDS believe that there would be some merit in a comprehensive review of how Regional Development Agencies approach the science agenda and how their policies support the Government's science agenda. There are already many examples of universities, either individually or in clusters, developing some of their research and teaching (Bachelors and Masters degrees) in ways that support the economic activity of their local area. Substantial Regional Government support in Australia has led to individual HEIs developing quite distinct and different agendas. Closer to home the activities of the Scottish Universities Physics Alliance is also worthy of note. UK Universities have also been instrumental in helping to change the type of industry operating in their locality through their research developments and active support for the creation of science parks. However, where RDAs are concerned we would advise great caution. While some may be successful supporters of economic development and work that is well established, we have no confidence in their ability to see beyond relatively close horizons or to develop forward-looking science policies that will result in real innovation. We would only add that any additional financial support for regional science activities must not be taken from current national science funding and RDAs.

9. RB Haldane's proposal 90 years ago stated that researchers, not politicians should make decisions about what research funds should be spent on. For many years this Principle has been mentioned in national discussions about research funding as though it still pertains to methods of research funding allocation. We do not believe that the Haldane Principle is applied to much of the Government research funding received by the universities, although, as far as we are aware, there has never been any open discussion about abandoning it. We believe that the time has come for a serious discussion about the Haldane Principle, something that could be one of the first inquiries carried out by a re-formed Science and Technology Select Committee (see paragraph 11).

10. Scientists command the respect of Government and the public. It is vital that this respect is maintained and that the Government can be seen to refer to independent and informed expertise. This can instil public confidence in the Government on issues from general day-to-day problems to major crises. It is essential that the discipline of independent, disinterested, scientific enquiry is recognised as a major benefit that the training of scientists has to offer. The contribution that science makes to the economy is beyond dispute. The contribution that the scientific process, "way of thinking" and method of approach, can make to society is significant and often underestimated. Emphasis should be placed upon this when engaging the public and increasing public confidence in science and engineering policy.

11. Government science and engineering policy needs to be scrutinised in as independent a way as possible. It remains to be seen whether any Government would wish to set up a wholly independent body of people to carry out such a task. To be totally independent such a group would need to be selected by a process that was far removed from Government Ministers or Government appointees, something difficult, but not impossible, to achieve in practice. However, a properly constituted Committee, with a similar remit to the previous Science and Technology Select Committee would make a very valuable contribution to this. It is very clear from our scrutiny of the new Innovation, Universities, Science and Skills Committee that, despite the efforts of its members, it has too wide a remit and has not been able to give sufficient attention to science issues. When discussing such issues we understand that the number of Committee members able to be present has sometimes been unacceptably low. UKDS therefore wish to press most strongly for the re-forming of a Science and Technology Committee that is given a remit that empowers it to look across Departments and scrutinise all aspects of science policy in all Government Departments.

12. UKDS believe that science and engineering will never achieve the position they deserve and the country requires until changes occur in the Lower and Upper Houses. Firstly, there need for far more MPs and members of the House of Lords who have a background in science and engineering. Changing the numbers of MPs will require political parties to be willing to make decisions about their choice of candidates who will stand in elections. We recognize that IUSSC has no control over this. However, the Government might be persuaded to increase the number of members of the Upper House who have scientific backgrounds. Perhaps even more significantly, there is another area where we believe scientists and engineers form a minority group—within the ranks of the civil servants who support the Government. UKDS strongly urge the IUSS Committee to review the numbers of qualified scientists and engineers who work in all Government Departments and to propose a significant increase in the future through appropriate changes to recruitment policies.

13. UKDS would be happy to provide further comments if required.

January 2009

Memorandum 17

Submission from the Royal Statistical Society

SUMMARY

The submission covers the following points:

— There needs to be a wide definition of Science and that it should take into account Business and Enterprise.

— Policy should be formulated by Scientists taking into account the broad view of other Scientists.

— Due to current funding arrangements and University policies Statistical Science has suffered and situation has become critical in terms of production of adequate supply of qualified statistician.

— Devolution promotes local concerns and so there must be concern over coherent policies emerging, perhaps there needs to be an appropriate unifying framework.

— Public consultation often results in the vocal minority expressing their views.

1. There is support for Department of Science within the Business and Industry Section Committee of Royal Statistical Society for the creation of Department of Science, but there needs to be an adequate description of Science which allows for adoption of other scientific subjects beyond solely Physical and

Engineering Sciences. Especially when appreciating the importance of scientific endeavour associated with the Service Industry. There is also a danger of separating Science off from application and implementation of findings if there is no close association with Enterprise and Business. There needs to be strengthening of this particular bond, whilst recognising need for fundamental research.

2. Formulation of policy is fraught with dangers when "non-scientists" play a major role in development of the policy. There is need for better informed policy making within the context of science and engineering. It should not be solely through limited channels of access and selected key individuals, but from the wider engineering and scientific community. There is a danger of missing opportunities and breakthrough if the gates to policy formulation are too narrowly confined within the scientific community.

3. The diversity of the community has to be recognised and there needs to be adequate consultation. The great danger within the community is the cost of "big" science which distorts budgets and means little or no funding for programmes which ultimately may have longer term effect.

Statistical Sciences have suffered, both from lack of research funding and also from University policies which have been short term. The shortage of trained and qualified statisticians to support science and engineering, as well as government and business, has become far too critical. There is a need to seriously address this issue before the long-term impact damages science and engineering research and other infrastructure. Failure to tackle this issue is a sign of the lack of success in consultation.

4. Devolution does mean there are competing agendas set by different political parties taking power. These must naturally reflect the local concerns of the regions and will impact on availability of resources.

Again the issue is then the contribution to and from the regions of big science. Perhaps there needs to be layers of policy-making that are unified within a framework rather than simply devolving policy to regions.

5. Public involvement through consultation is seen by a large number of researchers to be dubious, centred on specific lobby groups and special interests. Whilst governmental science and engineering policy has to gain acceptance generally, it is a fraught area for discussion when faced with some of the lobby groups involved. Views on consultation are changing overtime from naïve views of re-education to involvement, but this does not guarantee sound public involvement. Too often "public engagement" equates to collaboration with those within the public domain who are vocal.

6. The review of government science and engineering should be through the community of science and engineering as well as other interest groups such as government itself and business.

January 2009

Memorandum 18

Submission from the British Academy

Introduction

1. The British Academy, the UK's national academy for the humanities and social sciences, is pleased to respond to the Committee's inquiry, *Putting science and engineering at the heart of Government policy*.

2. The issues raised by the Committee are timely—it is essential that government policy draws effectively on the full range of expertise within the UK's world class research base. But this must include by disciplines in the humanities and social sciences (HSS) as well as those in science, technology, engineering and medicine (STEM).

3. Within each of these broad groupings of research a wide range of distinct methods is used. Policy formation has to draw on a variety of types of work. Many policies that draw on *empirical* work in STEM subjects also need to draw on *empirical* work in HSS (for example, drawing on sociological and demographic work to estimate effects on specific populations of possible policies if implemented), on *normative* work in HSS (for example, to identify options that it would be permissible/wrong or lawful/unlawful to introduce), and on *analytic* and *quantitative* work in HSS (for example to identify the economic consequences of proposed policies; to identify where there are dangers of introducing perverse incentives).

Summary

4. The British Academy makes the following key points:

— We agree that there should be an integrated approach across government. Any strategy to put "science" at the heart of policy-making should use a fully integrated concept of the science and research base—ie one that covers the humanities and social sciences as well as the natural sciences. Policy implications cannot be derived solely from empirical research or research in STEM alone.

Government policy makers need to draw more effectively on humanities and social science expertise, and leverage these under-valued assets to create a fully informed, rounded approach to public policy-making.

- The case has not been made for setting up a separate Department for Science. If such a Department separated research policy from HE teaching, it could be damaging. To separate "science" in the narrow sense from other relevant disciplines would be unfortunate and retrograde. A separate Department of "Science" (in the broad sense) would have to include HHS disciplines.
- The Government is failing to take full advantage of this country's world-class HSS research base, as shown in the Academy's recent report, *Punching Our Weight: the humanities and social sciences in public policy making*. There are deficits in the way that Government commissions research, but also there is a widespread misconception that the only research that matters is done in STEM subjects.
- The Government should be able to draw on the best advice available. The Government could do more to recognise the role played by learned societies as a source of independent advice.
- Current practice in public consultation often falls short of the best practice standards set by researchers. The Government needs to draw more effectively on the expertise available in HSS disciplines to improve its understanding of what works and what does not.
- There should continue to be an overarching national policy for science and research, rather than a series of regional policies. Quality in research is assured by a national approach. Both STEM and HSS research are based on groups and institutions that are not regional, indeed are often international. Any efforts to develop regional policies should ensure that they complement and feed into the overarching national policy.
- A careful balance should be struck between setting overarching strategic objectives and micromanaging the work of the research councils. Robust mechanisms are needed to encourage communication between Government and research councils to ensure that Government priorities do not inadvertently distort the research effort.
- Public engagement is an example of a public policy area where the Government needs to draw more effectively on what HSS research has to offer.
- It is essential that all relevant national and regional bodies recognise and play to their several unique strengths, and also (when required) work effectively together.

More Detailed Responses to the Committee's Call for Comments

The Committee has invited evidence on the specific issues in italics.

Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science

5. These are two separate questions. In response to the first, it is essential that "science" is at the heart of policy-making. But this requires a sufficiently broad concept of the science and research base, which is all too frequently lacking—ie one that covers the humanities and social sciences as well as the natural sciences. The social sciences and humanities are crucial for sound policy-making in their own right, as shown in the Academy's recent policy report, *Punching Our Weight: the humanities and social sciences in public policy making,* chaired by Sir Alan Wilson. In addition, scientific and technological advances have political, social and cultural implications, which can only be fully understood and translated into practice if all disciplines are accessed. It is now widely recognised that these implications need to be identified "upstream" if there is to be general public acceptance of significant changes in policy.

6. Understanding the influence of religious, cultural and language differences is essential for effective policy-making in many areas, and is of vital importance for much "scientific" (in the narrow sense) research. Linguistic, sociological, cultural and historical understanding of particular regions is also vital for fully rounded, effective foreign policy.

7. The science and research base will only be at the heart of government policy-making if effective cross-government mechanisms are in place. The new Cabinet Sub Committee for Science and Innovation (chaired by the Minister of State for Science and Innovation) is tasked with "considering issues relating to science and innovation, and [will] report as necessary to the Committee on Economic Development". While the composition of the Cabinet Sub-Committee makes it well placed to fulfil this important cross-government role, it will clearly be important that there continues to be parliamentary scrutiny to review the effectiveness of the Committee's work.

8. In response to the second question, the Academy believes that any call to set up a separate Department for Science will need to be backed up with evidence to demonstrate both the need for, and the added value of, such a Department. The current structure has much to commend it. At present, the Department for Innovation, Universities and Skills is responsible for science and innovation, and for further and higher education, with oversight of the bodies responsible for funding teaching and research and intellectual

property. To set up a separate Department for "science" could lead to a separation of university research policy from university teaching policy. In our view, this would be unwise, and would clearly work against efforts to ensure that the UK has a properly integrated higher education policy. For example, good graduate programmes responsible for the next generation of researchers need to be integrated into research practices and cultures, eg peer review.

9. If a Department for Science were created up, it would have to include the humanities and social sciences, in order to reflect the full range of the research base and provide the essential societal insights that are required to translate science and technology policy into practice. A narrow view of "science" would represent an unfortunate and retrograde separation of disciplines, utterly inappropriate in terms of the challenges facing society today.

How Government formulates science and engineering policy (strengths and weaknesses of the current system)

10. The Academy is concerned that the Government is failing to draw upon the potential contribution of the UK's world-class humanities and social science research base as effectively as it could and should—a major weakness of the current system. One reason for this is the way in which Government commissions research. Commissioning requires expertise, a capacity to identify which research has already been done, what is needed, how the questions should be framed, and finally how the findings of the commissioned work should be evaluated and implemented.

11. A second reason is a too ready assumption that the only research that matters is done in STEM subjects. HSS research is important in its own right to provide the evidence that government needs when formulating policy, and also to provide a critical voice, challenging assumptions, as well as reviewing and evaluating the success of government initiatives.

12. An inclusive concept of the "research base" rather than the "science base" should be the starting point for all considerations of policy by Government. As an Academy report, "*That full complement of riches*" said: "The language and concepts used by government to encourage the development of research and innovation are often derived unthinkingly from now outdated assumptions that seriously impede the full exploitation of the arts, humanities and social sciences, and the diverse kinds of knowledge they yield."

13. While there are welcome signs that the Government is trying to adopt more inclusive language and terminology, there is scope for greater progress, with the aim of including the humanities and social sciences "at the very beginning of strategic thinking on issues related to the future development of the UK's research and training base." This is particularly important as humanities and social science research (as demonstrated by *Punching our Weight)* contributes to many of the major strategic questions facing society today. Research in these disciplines enriches and informs society and provides the context in which policy and technological innovations can advance.

Whether the views of the science and engineering community are, or should be, central to the formulation of Government policy, and how the success of any consultation is assessed

14. These are two distinct questions. In response to the first, it is essential that the Government can draw on the best advice available. The Academy welcomed the recommendation made in 2006 by the Select Committee's predecessor, the Science and Technology Select Committee, that the Government should give greater recognition to the important role played by learned societies as a source of independent expert advice. In the Academy's view, there remains scope to enhance these relationships further. Through learned societies, Government policy makers can engage effectively with the wider research community.

15. As regards the second question, the Academy is concerned that current practice in public consultation falls short of the standards set by researchers. Standards of consultation practice need to meet appropriate standards of social scientific research. We believe that the Government could draw more effectively on humanities and social science expertise, in order to improve its understanding of what works and what does not, and to develop more sophisticated research methods and processes to underpin its engagement activities.

The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating

16. It would be counterproductive to replace a national science and research policy either with a series of regional policies or to attempt to develop a national policy based on regional policies. There is a risk of unnecessary duplication of effort and key national strategic objectives might be missed. In the Academy's view, there should continue to be a national policy rather than a series of regional policies for science and research. Regional issues could, of course, be fed into the overarching national policy.

17. We are unclear what the Select Committee has in mind when it refers to "updating" the Haldane principle. The Government clearly has to be involved in the setting of overarching strategic priorities for the research councils and other funders, but it should recognise that it is not in a position (and should not seek) to micro-manage their work. Furthermore, Government needs to anticipate better the likely (and sometimes

unintended) impacts that its proposed overarching priorities may have on the "day-to-day" decisions taken by the research councils. It is essential, therefore, that both the Government and the research councils should maintain effective communication, to enable the Government to understand better the likely impact of any proposals that it may have in mind.

Engaging the public and increasing public confidence in science and engineering policy

18. Public engagement is an example of an area in which HSS research is needed—it helps policy makers to understand and listen to the public's concerns—and where there is considerable scope to increase the use of HSS expertise. The Academy's response to *A New Vision for Science and Society* stressed that the new strategy for the UK should draw more heavily on the full range of expertise available within the humanities and social sciences research base and should also seek to improve the integration of HSS understanding and expertise into the work being undertaken in the natural sciences. For example, formulating an adequate public policy on genetically modified crops and other products requires both an understanding of the relevant bioscience and also an understanding of the social contexts that shape beliefs, as well the legal and regulatory frameworks within which the technology is developed. Integrating such understanding within technical debates is vital.

19. The Government's recent efforts to develop a two-way interactive model of public engagement with science ("upstream" public engagement, where the public can be involved early on and throughout research and development processes) rely upon methods and ideas developed in humanities and social science. More needs to be done to ensure that these methods and ideas are not applied mechanistically—the Government needs to improve its understanding of their role, limitations, strengths and weaknesses. As stated in our response to *A Vision for Science and Society*, current techniques of public consultation conducted by public bodies do not always meet the highest social scientific standards. The Government needs to draw more effectively on HSS expertise in order to develop more sophisticated methods and processes to underpin its public engagement activities. In particular, "the Academy considers that:

- the Government should review the impact of its past consultations on science-related policy, and conduct a meta-study on the success or lack of success associated with various approaches, and the reasons why some consultations are less useful than they might be.
- more work needs to be undertaken on the best ways of consulting with the public. There is no single template for public consultation, and understanding of the purposes strengths and limits of specific approaches is needed in commissioning any consultation in order to prevent the waste of public money.
- more work is needed to assess the reliability and effectiveness of various methods of "upstream" engagement."

The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy

20. All these bodies have distinctive roles. For example, the British Academy together with the other national academies, plays an important role as an independent and sometimes critical voice of government policies and initiatives, challenging certain assumptions and perceptions. It is essential that all relevant bodies recognise, and play to, their several unique strengths, and also (when required) work effectively together.

January 2009

Memorandum 19

Submission from the Council for the Mathematical Sciences

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

The Council for the Mathematical Sciences (comprising the Institute of Mathematics and its Applications, the London Mathematical Society, the Royal Statistical Society, the Edinburgh Mathematical Society and the Operational Research Society) would like to respond to the Innovation, Universities, Science and Skills Select Committee inquiry on *Putting science and engineering at the heart of government policy* with the following points:

- Mathematical sciences underpin all other science subjects, and developments in mathematical sciences often go hand in hand with advancements in biological, chemical and physical sciences. For a healthy research base and the construction of coherent government policy it is essential that the remit for any proposed Department for Science includes mathematics, statistics and

operational research. Clarity in the Committee's use of the word "science" in this context is very important. The subject of this inquiry should be putting "STEM" (Science, Technology, Engineering and Mathematics) at the heart of government policy. In some contexts (particularly secondary education) the word "science" is taken to mean only biology, physics and chemistry, which propagates the idea that science and engineering are separate to and can exist without mathematics.

— The CMS believes that the Research Councils' move towards directed research programmes and away from transformative research conflicts with the Haldane Principle; a review of the principle could be helpful in this context. The CMS welcomes the Committee's recent scrutiny of the Engineering and Physical Sciences Research Council's operations and is deeply concerned at the drop in the EPSRC Mathematical Sciences Programme budget from £21 million in 2006–07 to £14 million in the 2009–10 financial year.

We would be pleased to expand on these points if the Committee wishes.

January 2009

Memorandum 20

Submission from the Academy of Social Sciences

1. The Academy of Social Sciences is pleased to be able to make a submission to the IUSS Committee on this topic. The Academy comprises 500 Academicians, who are distinguished social scientists, and 35 Learned Societies and its mission is to be the voice of the social sciences in the UK for public benefit.

General Argument and Summary

2. The Academy's main argument is that science policy, and its application, would be strengthened and more effective if it fully incorporated perspectives and knowledge from the social sciences. This is because:

— most important scientific phenomena are in part determined by social processes so social science analysis helps to understand them;

— for many of today's policy challenges the relevant evidence comes from social scientific study of human attitudes and behaviour. The knowledge and insights offered by social science about particular policy areas can therefore improve the effectiveness of these policies;

— the scientific approach adopted by the social sciences provides complementary understanding to that obtained from STEM subjects.

3. Most government departments and agencies now recognise the important contribution that the social sciences can make, as the expansion of social science research staff in Government (GSRU) and budgets demonstrate. Two recent reports from the British Academy[47] and the Council for Science and Technology (CST)[48] have also endorsed the importance of the social sciences to Government policy. But science policy formulated by DIUS, as evidenced by the recent consultation on A VISION FOR SCIENCE AND SOCIETY does not reflect this. It appears to continue to be concerned, predominantly, with natural science paradigms and priorities.

4. An additional point is that while it is important that science and engineering policy draws on, and is informed by, all scientific perspectives it is even more important that knowledge and understanding based on good scientific research, including social science research, is applied to the implementation of all policies, not simply those concerned with science and engineering.

The Academy of Social Sciences' Responses to the Seven Issues Raised

1. *A Department of Science?*

5. The CST report argued that "the engagement between academics and policy makers in the UK is not as strong as it might be" (p 3). If scientific and engineering knowledge is to be put at the heart of policy-making, the relationships between researchers and academics on the one hand and policy makers on the other needs to be strengthened at every level.

[47] *Punching our weight: the humanities and social sciences in public policy making*. A British Academy report, September 2008. www.britac.ac.uk/reports/wilson/index.cfm

[48] *How academia and government can work together*. A report by the Council for Science and Technology, October 2008. www.cst.gov.uk/cst/reports/files/academia-government.pdf

6. It would be wrong to see one Department as being the sole repository of scientific expertise, particularly social science expertise. Appropriate scientific knowledge needs to be available in many policy areas within all government departments. Being able to draw on relevant knowledge and understanding is heavily dependent on the context and the particular issue being addressed. Scientific knowledge, particularly social science, needs to be embedded in individual departments and agencies.

2. *The way Government currently formulates science and engineering policy*

7. In its response to the DIUS consultation document *"A Vision for Science and Society"* the Academy of Social Sciences argued for much greater recognition of the diversity and heterogeneity of "science". The term "science" is a very abstract concept. Focusing on science *policy* is also a long way away from achieving better use of scientific knowledge and encouraging better understanding of the scientific ideas, which are among the objectives DIUS is seeking to achieve. A more nuanced understanding of the ways in which people think about science and engage with it would help government to develop relevant policies relating to scientific knowledge and would be preferable to one policy on "science and engineering".

8. The inclusion of the social sciences as sciences and the incorporation of social science understandings in discussions about science policies would greatly strengthen the policy formulation process. The previous Minister of Science, Ian Pearson, acknowledged that the social sciences are valued and used by government when he spoke at the launch of the British Academy report. However, while "Social disciplines" were included in the definition of science at the beginning of the recent DIUS consultation document, the text was almost entirely concerned with issues relating to STEM subjects. Science and engineering policy would be much stronger if the wider definition of "science" was fully accepted.

9. The post 1997 Labour governments have dramatically increased spending on science and engineering, with a particular increase in R&D spending on higher education (up by 38% between 1995 and 2005 from £3.5 billion to £5.6 billion, SET statistics 2008). This is welcome and must be continued even in recessionary times. The UK needs to keep pace with spending in countries such as the US, Finland, India and China.

10. A weakness is that there needs to be better integration in policy making between the different components of the science base to: support interdisciplinary research, make sure that adequate attention is paid to the resources needed for teaching UG/PG and PhD students and attracting foreign students and staff to the UK's universities and research institutions.[49] The lack of a real increase in R&D spending by UK business, especially by SMEs also needs to be addressed.

11. One of the problems is a lack of scientific expertise across Government. Appointing "robust and independent Advisory Councils and Chief Scientific Advisors" accountable to a Minister would help address this issue[50] as would further empowering them as recommended in the CST report.[51]

3. The centrality of the views of the science and engineering community to the formulation of government policy

12. It would not be appropriate within a democracy for the views of any one group of people outside Government to hold a central position in policy making. Ministers and civil servants inevitably have to weigh up the best course of action within what is essentially a political process. But up to date knowledge and understanding provided by the scientific and research communities is clearly an important component if the decisions taken are to be well grounded. This would not remove the need for policy makers to make value judgements about what is the correct course of action. "Science" is not value neutral as it works essentially through controversy and "contestation". Scientists often disagree about the interpretation of facts about which they are in agreement. Topics like climate change, GM foods or nanotechnology also raise social and ethical issues as well as scientific ones.

13. The scientific and engineering communities, including social scientists, therefore have a significant contribution to make to policy-making and responding to formal consultation exercises is one way of doing this. But it is important that there are a range of mechanisms for engaging external people in the policy process and a need to balance external perspectives with those of in-house researchers and advisory committee members. Having relevant expertise available at short notice is probably more important to informed policy making than occasional consultations. The CST report makes a number of sensible recommendations for ways of strengthening existing mechanisms.

[49] *International excellence: Valuing International Scientists and engineers*, report from the Campaign for Science and Engineering in the UK (CaSE).
[50] Nick Hall, *CaSE News no 58* December 2008.
[51] As above. A Core recommendation to Government, page 16.

4. *A regional (versus national) science policy?*

14. There is a need to develop scientific capacity, and to apply relevant knowledge to the issues being faced, at a sub-national level. This is particularly important for the social sciences as the relevant knowledge may be very specific to the local circumstances. However regional science (technology and innovation) policy requires appropriate expertise at the regional level, for example in the RDAs. We doubt whether this is in place at the moment and suggest a first step would be for the major players to commit to the necessary skills and resources, as well as to the development of effective policy at this level. There are a number of bodies at a regional level that have developed good relations with higher education institutions in their area. This could usefully be expanded to establish better networks between universities, regional bodies, cities and funding agencies.

15. It is important that scientific research, across all disciplines, allows for the pursuit of some "blue-skies" thinking and the exploration of ideas that do not have immediate policy relevance. The Haldane principle that decisions about research funds should be made by researchers rather than politicians, or the modification proposed by Rothschild, continues to have validity. However, it is now generally recognised that other stakeholders and the general public have a beneficial role to play in decisions about research priorities and we consider this should continue for the majority of publicly funded research. However, we also agree with Dusic (2008)[52] that there needs to be greater transparency in the relationship between research councils and DIUS —the extent of the former's independence—and the extent to which government is directing decisions.

5. *Engaging the public and increasing public confidence in science and engineering policy*

16. There is already considerable public engagement in scientific issues. The wealth of publications about popular science demonstrates the extent of public interest and surveys of public attitudes to science confirm this. In its response to the DIUS consultation document the Academy of Social Sciences emphasised the importance of two-way engagement and the need to see people as active participants rather than simply consumers of scientific knowledge.[53] The Government should not expect that "engagement" means only positive support for individual policies. Public debate about the direction and outcomes of scientific endeavour, and more "upstream" engagement, are all part of enabling people to develop informed views. There are many fora for public engagement on science issues where natural and social scientists come together with members of the public, for example in the environmental movement. These bodies should be recognised as promoting informed engagement rather than putting forward partisan views which are therefore ignored, as sometimes happens.

17. Being able to make full use of knowledge from existing fora and other forms of public engagement is likely to require some changes within the civil service. The CST report draws attention to what is widely known, that there is a lack of collective memory within Government and poor knowledge management. The Academy supports the recommendation that "Government should place a greater focus on promoting effective knowledge management within the Civil Service".[54]

6. Roles of different bodies in determining UK science and engineering policy

18. In the final analysis a Government policy has to be determined by a Government Department—at the present time the Department for Innovation, Universities and Skills. Other organisations and agencies have important roles to play in contributing views and information when policy is being developed, as has recently happened with *"A Vision for Science and Society"*, and in putting it into effect. The Academy published a report in June 2008 of a joint project with the ESRC which looked at the role that Learned Societies in the social sciences can play in developing knowledge transfer and public engagement.[55] A wide range of ways in which learned societies could become more engaged with policy makers and the general public were identified. The Academy is now exploring how it can best take this work forward and is seeking the resources to do so. The CST report also recognised that much greater use could be made of the Learned Societies, among others. Learned Societies have strong academic links and can provide experts in a given field at short notice, so are an important source of external capacity.

19. The Academy of Social Sciences considers that existing bodies such as the Council for Science and Technology, the Science Council, and Sciencewise all make significant contributions to the development and dissemination of science policy. But the social sciences are not well represented on these bodies and we believe that the remit of these bodies should be seen explicitly to include the social sciences and therefore the social and cultural aspects of science policy.

[52] *Research Fortnight,* 21 May 2008 http://www.pacrowther.staff.shef.ac.uk/RF302_Haldane.pdf

[53] A response to the DIUS consultation document from the Academy of Social Sciences. Can be found under Consultations on www.acss.org.uk

[54] As above, Recommendation 3 page 20.

[55] *Developing Dialogue*: *Learned Societies in the Social Sciences.* 21st Century Society, Vol 3 Supplement December 2008 and www.acss.org.uk/activities2b.htm

7. *The scrutiny of science and engineering policy*

20. The IUSS Committee is itself the key body to scrutinise science and engineering policy. This work could be better supported if the recommendations of the CST report are acted upon and mechanisms are put in place for improving engagement between academia and policy makers—and ideally more widely to include public engagement. This would allow for policy makers to get feedback, both positive and negative, on an ongoing basis. Bodies like the Academy of Social Sciences and/or its constituent learned societies would be encouraged to formulate views and obtain feedback if it was confident that its contribution would be heard.

January 2009

Memorandum 21

Submission from the Science and Technology Facilities Council (STFC)

Summary

- The UK's science and engineering base is one of its strongest assets for innovation and future economic growth.
- The Government's ten-year investment framework from 2004–2014 supports UK science and innovation. A Large Facilities Capital Fund provides capital funding for the construction of large research facilities.
- Developing, building and operating large national and international research facilities for the UK requires a long-term outlook. Such facilities have lifetimes measured in decades and require skilled teams of scientists, engineers and technicians to design, build, operate and exploit them.
- Short-term funding variations through the Spending Review cycle can potentially damage the ability of STFC to effectively operate key scientific infrastructures. This in turn can weaken the return on these investments and adversely affect the confidence of the UK's international partners in collaborative endeavours.
- STFC recommends the consideration of policy models for through-life resourcing of large research facilities over the long term to ensure that best use is made of the capital investment and to ensure the maximum scientific, social and economic returns for the UK.

Introduction

1. This submission to the IUSS enquiry "Putting Science and Engineering at the Heart of Government Policy" provides information to the Committee related to the unique research portfolio of the Science and Technology Facilities Council (STFC).

2. This submission is complementary to that submitted by RCUK on behalf of all research councils and which the STFC fully supports.

3. Within the research council family, the role of the STFC is to lead on the provision of large-scale research facilities. STFC facilities cover the full research base, from physical and biological science, to archaeology and fine arts. STFC facilities are used by researchers supported by all the research councils, for topics as diverse as probing sub-atomic world of particle physics, developing new medicines, designing new materials, and exploring the vastness of space and the Universe. STFC facilities also support broader constituencies, including industry directly, as well as scientific researchers from around the world.

4. As a result of sustained public investment over a number of years researchers in the UK now have access to some of the world's best scientific research facilities. Examples include:

i. The Diamond Light Source, the largest ever single investment in scientific infrastructure on UK soil.
ii. The Large Hadron Collider (LHC) at CERN, the most powerful particle collider in the world built with substantial contributions from the UK
iii. A second target station at the ISIS neutron source, opening to researchers in 2009, which will provide a substantial enhancement, optimised for soft matter, to an already world-leading facility
iv. World-leading laser facilities, in particular at the Central Laser Facility based at Rutherford Appleton Laboratory in Oxfordshire
v. Cutting-edge space research funded through the European Space Agency, international bi-lateral agreements and collaborations with national space agencies, including NASA
vi. The world's best ground-based telescopes, for example the Atacama Large Millimetre Array (ALMA) in Chile.

5. STFC has been designed to take full advantage of the synergies between and long term nature of these investments, integrating grant-funded HEI based studies with large scale international programmes and facilities. As stated by the Minister at its formation, "The aim of the new council will be to create a more integrated approach to large scientific research facilities, including in international negotiations for long-term projects involving several countries acting together; to obtain more value from the knowledge and technologies developed as a result of the new council's programmes; and to deliver both those goals using the two science and innovation campuses at Harwell and Daresbury as identifiable knowledge transfer centres that host UK-based large-scale international facilities."

6. One demonstrable positive benefit of the creation of STFC has been the increased influence of the UK in international and European scientific planning forums, such as the European Strategy Forum on Research Infrastructures (ESFRI).

Research Lifetime of Facilities

7. The UK's science and engineering base is one of its strongest assets for innovation and future economic growth. Alongside the 2004 Spending Review, the Chancellor of the Exchequer, Gordon Brown, announced a ten-year investment framework for UK science and innovation. The long-term strategy for supporting UK science saw the Government give its commitment to make the UK one of the most competitive locations in the world for science, research and development and innovation, and foster a climate in which talented individuals and enterprising companies can flourish.

8. Providing cutting-edge facilities for the UK research base is an essential part of a long term strategy to retain and grow the UK's competitiveness in the global economy. In harsh economic times, the "business case" for investing in science and the wider research base is even more compelling. Continuing to invest in the research base, and even increasing investment, is vitally important. Only in this way can we position the nation to take full advantage of an economic recovery.

9. Many of our national and international facilities, like Diamond, ISIS and the LHC at CERN, have a lifetime measured in decades. Planning for Diamond, for example, began more than a decade ago, and its construction was agreed on the understanding it will have at least 28 years of operation.

10. Large research facilities require skilled scientists, engineers and technicians to operate and exploit them. Again, this is a long-term requirement and needs long-term commitment. It takes 13 years of formal education to produce a secondary school student capable of even undertaking an undergraduate science degree, before further years of effort to achieve post-graduate qualifications.

11. A unique aspect of large research facilities is their long-term nature and their development as a part of international collaborative programmes. They take many years to plan, develop and complete in part because they involve complex construction phases, but also because they require ongoing problem resolution throughout the delivery. Many are in effect, their own prototypes, for example, the Large Hadron Collider.

12. Research teams and capabilities often take many years to establish, so any sudden change of direction in terms of funding support can be both frustrating and damaging to UK science and its international reputation. With this in mind it is essential that Government policy regarding funding for scientific facilities should be phased over a time period consistent with the typical duration of projects and the lifetime of the infrastructure. We note that this need for a long-term perspective on funding was highlighted in the recent RCUK Review of UK Physics led by Professor Bill Wakeham.[56]

13. Taking this long term view for research requires courage, particularly in difficult financial times, but it is essential if the UK is to maintain and improve its position as a competitive knowledge- and skills-based economy.

Sustainability Through Forward Planning

14. The lead time in developing, building and operating large facilities is long, typically not less than 10 years to develop and build, with operational lifetimes of 30–40 years. STFC facility operations must be addressed from a long-term strategic viewpoint and sustained investment in their continued operation is needed for them to deliver their full potential over their projected lifetimes.

15. 80% of the STFC's budget is devoted to facility operations and development: international subscriptions account for half of this commitment and national facility operations and development programmes account for the other half. For particle physics and astronomy alone STFC spent £154.42 million in 2006–07 on international subscriptions.

16. By their nature, these annual spending commitments are long term and there is little practical flexibility in the short-term. Relatively small reductions in facility spending allocations in the short term tend to have a disproportionate impact on the scientific and ecomomic return on total investment. This is because a large percentage (typically 85%) of the cost of operating a facility is the fixed cost of ownership (staff costs

[56] http://www.rcuk.ac.uk/review/physics/default.htm

and maintenance in a safe and operational state). The only costs that can effectively be reduced in the short term are the marginal costs related to the number of operating days, resulting in a disproportionately large reduction in the throughput of experiments.

17. Decisions to close facilities or withdraw from international agreements have significant consequences (eg political, reputational, skills availability) beyond the immediate area of science. There are long lead times in changing the status of, often international, agreements, or withdrawing from or closing facilities. Such decisions require close involvement of the Government of the day. Short-term funding variations, on the Spending Review cycle, can potentially damage STFC's ability to support key scientific infrastructure. Furthermore it can create uncertainty with international partners and potentially weakens the UK's position as a potential driver for new international facilities and programmes, including inward investment into the UK.

18. Because of the nature of its business, STFC has developed, and continues to refine, long-term strategies across the whole of its programme; each tailored to ensure that the UK is in a strong position to influence the international debate and maximise returns for the UK.

19. The STFC maintains a rolling 10-year plan which sets out financial requirements to deliver approved programmes, and financial projections for future planned programmes. As part of the process of developing this plan, a critical analysis has been carried out on cost drivers for the programme, to ensure that the financial projections are realistic. The 10-year planning process enables STFC to:

i. capture and assess the resource implications of the future plans of each element of our programme, for both operations and development activity;

ii. continuously track changes to plans and their status as they move through our approval and post-approval monitoring processes;

iii. identify the expected lifetimes of projects and programmes and identify when programmes will "sunset", thereby allowing investment in new programmes;

iv. provide a reliable basis for making future investment decisions against the current and projected financial landscapes.

A "Large Facilities Operational Fund"?

20. In recent years there has been significant new investment in the science base supported by the STFC, for example Diamond, ISIS Second Target Station, ESO, LHC, Aurora. Within the period covered by CSR07 and the next two spending reviews many of these will mature to the point where they could start to deliver optimum return on that investment. Operational funding must be commensurate to the capital investment for the UK to see the appropriate return on the investments.

21. The UK takes a strategic view as to the best way to maintain access for researchers to large facilities and to manage the investment of public funds. The Research Councils publish a Large Facilities Roadmap to guide investment. The first version of the Large Facilities Roadmap was published in June 2001 and then updated in 2005 and 2008.

22. The Large Facilities Capital Fund (LFCF, administered by DIUS and typically £100 million per annum) was established to support Research Council investments in large research facilities with capital funding that could not be sensibly accommodated from within Research Council budgets or within spending review cycles. It concentrates on those facilities identified by the Research Councils as being of the highest strategic importance and which require significant investment for the Council concerned.

23. The LFCF provides a funding contribution to the capital costs of the construction of new facilities either nationally or internationally, or the expansion or enhancement of existing facilities. Examples of current projects at STFC supported through this route include Phase 2 and Phase 3 instruments at the ISIS Second Target Station and Phase 2 and Phase 3 instruments at Diamond Light Source.

24. Other funding is available in the UK for large facilities and infrastructure from Government Departments, Regional Development Agencies, Devolved Administrations, charities, the private sector, the European Commission, and other international bodies. Examples here include the 14% stake in Diamond Light Source Ltd by the Wellcome Trust, and the development of infrastructure for new businesses at the Daresbury Science and Innovation Campus by the North West Development Agency.

25. Our programme also contains modest provision for a number of new, high priority investment programmes to maintain the UK's lead in areas where it is already world leading; existing examples are HiPER, New Light Source, XFEL, ELT, SKA, and in the near future a Next Generation Neutron Source.

26. In addition to providing large national facilities, the UK's international subscriptions are undertaken by STFC on behalf of the nation. As well as providing access to world-leading facilities essential for the UK's scientific competitiveness, and in doing so representing important assets that need to be handled as a UK-wide resource and not as STFC programmes, they also underpin the UK's reputation as a credible scientific partner and open up avenues for working across national boundaries that are increasingly important.

27. Whilst the STFC's programme takes account of the timely phasing out of and withdrawal from certain programmes, the UK's ambitions are increasing as science and technology research becomes ever more central to economic competiveness. Furthermore the newer generation facilities are significantly more capable, and therefore more expensive to develop, build and operate than their predecessors. This is matched by a commensurate increase in scientific and economic impact.

28. STFC carries significant obligations for the careful management of these national interests. However, international subscriptions are affected by inflation, fluctuations in currency exchange rates and national GDP levels. These are beyond STFC's control and limit flexibility in financial planning with potentially serious impact to our domestic research programme.

29. The existence of an earmarked funding line for major science facilities (the "Large Facilities Capital Fund", LFCF) has provided a very successful mechanism for appropriately controlled and prioritised investments.

30. STFC proposes that it may be beneficial for Government policy to consider adopting a through-life resourcing mechanism, or a "Large Facilities Operating Fund", to match the LFCF facility, whereby the key strategic elements of the scientific research and broader exploitation of large facilities are assessed and funded via long-term plans.

European Perspective

31. Excellent science can only be delivered when working with, and benchmarked against, the best scientists in the world. In many circumstances, the UK's interests will be best served by participating in a facility overseas, for example, through international subscriptions or bilateral/multilateral arrangements with other countries to build facilities either abroad or in the UK. In this context, the UK needs to take a view on when and how to participate in major new international facilities, considering the potential for the UK to provide global direction and to disseminate UK excellence, attract the best researchers in to the country, as well as enhancing the international collaborative activities of UK researchers.

32. The road map approach to large infrastructure planning pioneered by the United Kingdom has been widely commended and adopted by others. Provision of research facilities can be undertaken in three main ways:

i. As a national UK facility;

ii. Jointly with European partners, either in the UK or elsewhere;

iii. Jointly with other global partners (such as the United States), either in the UK or elsewhere.

33. The European Strategy Forum on Research Infrastructures (ESFRI) has played a major role in developing a roadmap of research facilities of interest to European states. Set up in 2002, ESFRI is a group of senior science administrators from across Europe who advise national governments and the European Commission on infrastructure needs.

34. ESFRI released its first roadmap in 2006. On 9 December 2008, ESFRI released an updated roadmap of 44 projects. The construction cost for all 44 projects over the next 12 years would be about €18 billion. The EU's Seventh Framework research programme allocates just €1.7 billion to such costs.

35. A substantial fraction of the ESFRI Roadmap facilities are of interest to UK researchers and therefore appear in the RCUK Large Facilities Roadmap, either as potential future facilities that might be constructed in the UK with international collaboration, or as overseas facilities to which access for UK researchers is desirable.

36. Despite the ESFRI roadmap, current arrangements concentrate attention on availability of capital funding to build facilities, but again there are significant weaknesses in assessing their ongoing costs, and the impact (normally in future spending review periods) of meeting those costs on the balance of research council funded activities. At prioritisation, estimates of costs and assessments of benefits are preliminary, yet priorities are not reviewed if costs or benefits are significantly revised as business cases are prepared.

A Way Forward

37. By exploring different funding structures STFC could be provided with enhanced flexibility to extract the maximum benefit for the UK from its research programmes to drive forward UK priorities and to leverage external funding.

38. One possibility would be to provide guaranteed baseline funding for effective exploitation and operation of central facilities allocated alongside capital funding. This will allow a clearer case to be made of the requirement for, and impact of, large scale infrastructure investments. Similarly, early-stage R&D to enable new facilities and national science/technology programmes must be integrated into this approach. Such long term forward-looking planning will ensure best use is made of the capital investment.

39. A similar long-term approach should be adopted for technology and science programmes that underpin strategic developments (for example in materials, space and particle physics), and for the exploitation of international subscriptions. Solutions can lie within the research councils, in the HEIs, and/

or in specialist entities such as the Cockcroft Institute for Accelerator Science. Of course, for both the programmes and facilities this long-term perspective needs to be fully coordinated and balanced with a substantive ongoing ability to explore innovative new ideas via responsive-mode funding from STFC and other funding agencies.

40. STFC would welcome the consideration of a revised policy model for through-life resourcing of large research facilities and commitments in which funding arrangements match the long-term strategic nature of our programmes.

January 2009

Memorandum 22

Submission by GeneWatch UK

GeneWatch UK is a not-for-profit group that monitors developments in genetic technologies from a public interest, environmental protection and animal welfare perspective. GeneWatch believes people should have a voice in whether or how these technologies are used and campaigns for safeguards for people, animals and the environment. We work on all aspects of genetic technologies—from GM crops and foods to genetic testing of humans.

GeneWatch welcomes the opportunity to input to the Committee's inquiry. We are currently completing an investigation of the corporate shaping of science, innovation and the economy in the UK and Europe and our submission draws on some of the findings of this investigation (which has not yet been published).

SUMMARY

Major Government and EU investments in science have been driven by a political commitment to the knowledge-based economy (KBE), in which science and technology—particularly biotechnology—are seen as the key drivers for economic growth. However, there is a stark contrast between this political commitment and the failure of the biotech industry to deliver economic benefit.

GeneWatch UK's research suggests that the idea of the KBE is failing in at least four ways:

— It is not delivering, and cannot deliver, the promised revolutions in health, agriculture and sustainability. Indeed, in many situations, the false solutions that it offers may undermine alternative approaches and create significant opportunity costs.

— It is not delivering, and cannot deliver, a "race to the top" for Europe's economies.

— By locking "knowledge" into intellectual property, it fixes old ideas (such as the idea of genes as major risk factors for common diseases) and seeks to market them, distorting research priorities and promoting misinformation, rather than stimulating creativity. Patenting also prioritises "technologies of control", designed to monopolise markets and maximise profits. People are unlikely to accept such technologies as of benefit to them.

— The uncritical promotion of (often barely credible) technical solutions for major social problems, combined with the loss of independent expertise to inform policy and regulation, is undermining democratic values and trust in institutions.

The questions posed by the Committee cannot be answered without radically re-thinking the relationship between science and society. This requires a major overhaul of the research funding system, including:

— More democratic decisions about research funding priorities;

— Greater accountability and scrutiny of research investment decisions: including economic assessments and appraisals;

— Public engagement in setting research questions and priorities;

— More funding for research which does not necessarily benefit large corporations but may deliver other benefits;

— Fundamental reform of the science advisory system and the system for providing incentives for and assessment of research, including major reform of the patents system;

— Funding for "counter-expertise" and multi-disciplinary research;

— A commitment to take public opinions into account in decisions about science and innovation.

Q1. *Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science.*

Q3. *Whether the views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is assessed.*

1. These questions cannot be answered without considering how decisions are being made about what science and engineering projects are supported, and the relationship between science and society. GeneWatch agrees with the researchers on science and innovation policy who argue that a radical revision of this relationship is required, which reviews past experiences properly and reflects in a fundamental way on how to support more democratically and technically robust science and technology policies.[57,58]

2. Science and engineering play important roles in society, but many other factors and types of knowledge are also important in formulating Government policy. In addition, progress in science depends on specialisation, but this can also lead to ignorance about alternative approaches and/or the potential unintended consequences of particular scientific assumptions or applications. Some engineers argue that the present intellectual and professional division of labour and the knowledge infrastructure built on it together prevent genuine solutions by promoting an "end of pipe" approach to dealing with problems and relying too much on specialists who are often unaware of the undesired effects of their decisions.[59] Others have argued that treating science as an instrument of policy, serving the interests of government and commerce, neglects the important "non-instrumental" roles of science: including the creation of critical scenarios and world pictures; the stimulation of rational attitudes; and the production of enlightened practitioners and independent experts.[60]

3. GeneWatch UK's research, the main outcomes of which are described below, suggests that the Government's commitment to the so-called "knowledge-based economy" is distorting research priorities (towards what is patentable, rather than what is scientifically valid or useful); changing the nature of science itself and what is considered "knowledge"; and undermining access to independent advice on science and technology—especially the ability to assess claims about the benefits to be delivered as a result of investments in particular innovation strategies. Members of the Council for Science and Technology and other Government science advisors represent a narrow range of interests, dominated by a strong commitment to biotechnology, nuclear power and surveillance technologies. Unless this expertise is broadened, attempts to bring advice on science and technology closer to the heart of government will only further erode public trust in Government science policy and faith in its claims about the benefits of investing in the "knowledge-based economy".

Q2. *How Government formulates science and engineering policy (strengths and weaknesses of the current system).*

4. The idea of the knowledge-based economy has become a key driver of research investment in Britain, Europe and worldwide and underpins how Government formulates science and engineering policy. The "knowledge" embedded in a product is seen as adding value to it and is protected by intellectual property rights, which gives value to this knowledge and allows it to be traded rather than freely used (by applying protectionism to "knowledge" rather than to goods). Within the European Union, the advocates of this approach argue that Europe, with its scientific institutions and capacity to produce knowledge, will be able to capitalise on this globally and sustain Europe's economy in the face of the threat from China, India and other developing countries that are rapidly industrialising and where manufacturing costs are low.

5. Supporters of the knowledge-based economy (KBE), claim that science and technology will be a major driver of economic growth and at the same time deliver technical solutions to health, agricultural, social and environmental problems, within Europe and world-wide.

6. Biosciences and biotechnology—particularly human and plant genomics—are seen as central to the knowledge-based economy, as are information and communication technologies. For example the EU's Competitiveness in Biotechnology Advisory Group (CBAG) states:[61]"*Both during and since the Lisbon and Stockholm summits, biotechnology has been clearly identified as the backbone of a knowledge-based economy, a vital driver of Europe's competitiveness*". Along with new genetically engineered products—including plants, animals and micro-organisms—"genetic information" is seen as a commodity. In Britain in particular, access to human genetic information, obtained from patients in the National Health Service (NHS) and linked to electronic medical records, is seen as a key selling point to attract the biotech and pharmaceutical industries.

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[59] Vanderburg WH (2006) Can the university escape from labyrinth of technology? Part 1: Rethinking the intellectual and professional division of labour and its knowledge infrastructure. *Bulletin of Science, Technology and Society*, 26(3), 171–177.

[60] Ziman J (2003) Non-instrumental roles of science. *Science and Engineering Ethics*, 9, 17–27.

[61] http://ec.europa.eu/enterprise/phabiocom/docs/cbag_2004_report_2005-01-21_final_version.pdf

7. However, there is a stark contrast between the political commitment to biotechnology as a driver for growth and the failure of the biotech industry to deliver economic benefit.[62,63]

8. GeneWatch's investigation highlights major weaknesses in this policy framework. This does not mean that biotechnologies and the biosciences cannot contribute to health, agricultural or sustainability objectives, or to the economy. However, it does mean that it is necessary to re-think the whole idea of the "knowledge-based bio-economy" (KBBE) and the knowledge-based economy in general.

9. We conclude that the vision of the knowledge-based economy is deeply flawed because it is based on the idea of knowledge as a commodity that can be patented and then bought and sold. In this system, both social and scientific tests of what is considered knowledge are abandoned in favour of valuation by the market. Knowledge becomes defined by whatever can be commercialised and alternative understandings or approaches are dismissed as unscientific or anti-progress. In adopting this approach, policy makers undermine the knowledge and debate on which they and society at large rely to make informed decisions and to make realistic and informed appraisals of techno-scientific claims. This can lead to political entrapment in particular innovation strategies as a result of factors which include: the preference for advance over retreat (the tendency "*to favour the investor over the protestor*"); the digging in of commitments at the outset of risky, complex and costly projects; the neglect of externalities; and the entrenchment of political commitments and sunk costs, leading to an escalation of commitments ("*good money thrown after bad*").[64] This creates an innovation system in which political commitments are "dug in", in contrast to one in which many diverse and creative alternatives are being pursued.[65]

10. The main findings of GeneWatch UK's investigation are that:

1. Major investment decisions in R&D and in research infrastructure are being made by the EU and by the UK Government without due scientific diligence or cost-benefit analysis. "Optimism bias"—leading to significant underestimates of social, environmental and economic risks—is rife. Yet the UK Treasury does not apply its rules for economic assessment or appraisal to major R&D investments, unlike other major infrastructure projects.

2. To help drive the knowledge-based economy, expertise from a narrow range of industries seen as key to the KBE has been integrated into the scientific institutions, government departments and research councils where research funding decisions are made. Industry representatives appointed to research funding boards are likely to influence research strategies and choose research priorities from their own perspective. This is taken to a new level by the European Technology Platforms, where research strategies in food, health and agriculture are being determined by the "vision" of the relevant commercial sectors.

3. Although many major R&D investments involve public-private partnerships—including those developed by the biotech industry as part of the EU's European Technology Platforms—the risks are largely borne by the general public and the taxpayer.

4. A small number of enthusiasts for particular approaches dominate the decision-making processes for R&D investments. These individuals often have vested interests in promoting these approaches. Barely credible claims are often made that the development of genetics and genomics, including GM crops and large-scale genetic databases, will eliminate problems as diverse as hunger, cancer, crime, obesity and adverse drug reactions. Typically no independent analysis of these claims is made and critics are dismissed as "anti-science".

5. Political commitments to particular approaches and the role of vested interests are often hidden and rarely open to proper public scrutiny. For example, the UK Government and the EU's DG Research have both endorsed a paradigm shift in medicine to personalised prevention based on genetic risk prediction. This approach has been variously supported by the tobacco, nuclear, chemical, food and pharmaceutical industries as a means to expand the market for medicines and functional foods and to avoid controls on unhealthy products and pollution, by promoting genetic explanations for cancer and obesity. There is no evidence that it is of benefit to health or likely to be cost-effective.

6. The research funding system encourages the patenting, promotion and marketing of scientific discoveries, even though most published research findings are false.[66] This undermines the concept of the scientific method as a means of formulating and testing hypotheses with experimental evidence, and replaces it with a system that encourages exaggerated claims, including to policy makers and investors and to the public via the media.

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7. Science and innovation has become increasingly disconnected from the users of research. This is most striking in food and farming research, where agricultural colleges and traditional plant breeding have largely disappeared and research priorities are driven by what can be patented by commercial seed companies or "add value" for food manufacturers.
8. There are likely to be significant opportunity costs as a result of poor investments made via the current research funding system. Billions of pounds and euros are being spent on ineffective or spurious solutions to major social, environmental, health and economic problems: including hunger and obesity.
9. The public is becoming increasingly alienated and disillusioned and is sceptical that research priorities are being set in the public interest or that they will deliver economic benefits. For example, the Science Horizons project found that it is widely assumed that policy-makers in government and big business are not candid with citizens and that technology is being developed by industry and/or government in order to make profits, rather than in response to societal needs.

Q4. *The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating.*

11. The Haldane Principle implies that researchers are best placed to determine detailed priorities; that government's role is to set the over-arching strategy; and that research councils are guardians of the independence of science from too much government interference. It is often cited to state that scientists rather than politicians should determine how research funds are spent. However, the Haldane Principle does not reflect reality because the entire system of research funding is now shaped by institutional commitments to the knowledge-based economy.

12. GeneWatch believes that research funding decisions are inevitably *political* decisions, about how to best spend public money, which institutions to support and what incentives to provide to researchers in academia and industry. These decisions have economic consequences and potentially affect the lives of billions of people, because they influence what questions are asked and which approaches are adopted to tackle the problems that we face. Research funding decisions in food, health and agriculture can literally be life or death decisions and can also impact profoundly on the environment and the lives of future generations. [67,68,69,70,71,72,73]

13. Research funding decisions need to take into account what research is considered scientifically "doable". But they are not—and cannot be—made in some pure "scientific" way. History shows that such decisions are always shaped by politics and by vested interests:[74] the challenge is how to improve the system to make better, more accountable decisions.

14. Motivations for researchers include curiosity, reputation, career, research money for the creation and development of a research team; and personal income.[75] Building individual and collective careers creates scientific "bandwagons" that promote further investment in particular research agendas.[76] Since 1997, the system of incentives for researchers has been strongly influenced by the Government's commitment to the knowledge-based economy, as defined and promoted by the OECD.[77] Patents, based on science not validated by other academics, have become part of the equation that measures prestige, and therefore career advancement and funding.[78] The scope of patents has also broadened to include what previously would have been regarded as discoveries rather than inventions (including plants and human genes). Other factors which influence what research gets done include academic disciplines and hierarchy. For example, in the past, medical research was largely done by physician-scientists who also treated patients, but this changed with the explosion of molecular biology in the 1970s, when clinical and basic research started to separate.[79]

[67] Leroy JL, Habicht JP, Pelto G, Bertozzi SM (2007) Current priorities in health research funding and lack of impact on the number of child deaths per year. *American Journal of Public Health*, 97(2), 219-223.
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[69] Woolf SH, Johnson RE (2005) The break-even point: when medical advances are less important than improving the fidelity with which they are delivered. *Annals of Family Medicine*, 3(6), 545–552.
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[71] Woolf SH, Johnson RE (2007) Inattention to the fidelity of health care delivery is costing lives. [Letter]. *American Journal of Public Health*, 97(10), 1732–1733.
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[77] OECD(1996) The knowledge-based economy. OCDE/GD(96)102. Paris 1996. http://www.oecd.org/dataoecd/51/8/1913021.pdf
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There has been a marked decline in the numbers of trainees and professionals in physiology and pharmacology as the more reductionist disciplines of molecular biology and genetics have gained in prestige and influence.[80]

15. Because scientists are in a fierce competition to maintain and increase public support and funding they routinely hype the practical applications of their work, yet peer reviewers do not assess the credibility of the claims made for the future benefits that might arise from the research.[81] Hype is often influenced by commercial interests, is reported uncritically by the media, and distorts public expectations and research priorities.[82,83,84,85,86,87,88]

16. Biotechnology became a business when the knowledge emerging from scientific research became Intellectual Property (IP) that was valued and could be bought and sold: however this business model has not been successful, and the expansion of the patent system is increasingly widely criticised for being counter-productive to industry as well as raising serious ethical concerns.[89,90,91] "Knowledge" that is patented—the key measure of the knowledge-based economy—does not represent a scientific consensus about what has been established, or meet traditional definitions of knowledge as established by the "scientific method". For example, so-called "genetic information" is mostly wrong[92] but this genetic misinformation is now being marketed directly to the public, with potentially serious implications for public health.[93]

17. The current system of research funding, in the context of the knowledge-based economy, means that—with some exceptions—most public research funding tends to follow the research investment strategies set by vested interests linked to powerful industrial sectors, rather than seeking the most effective ways to tackle serious problems such as hunger, obesity and environmental degradation. For example, the food industry's research priorities are not necessarily those most likely to be effective in tackling the current epidemic of obesity and diet-related disease,[94] and important gaps in health research reflect biases within the health research economy which mean that research that is unlikely to be profitable or is of little scientific interest tends to be neglected.[95]

18. Closer links between universities and communities at a local or regional level; and the development of science policies at regional level—or the level of the devolved administrations—could play a part in making decisions more accountable. However, updating the Haldane Principle is an inadequate response to the pervasive effects of the Government's commitment to the KBE. A major re-think of science policy is needed. The issues that need to be addressed include:

— Who defines the public interest?

— What mechanisms and institutions are needed to attempt to deliver public benefit from science and technology?

— How can "blue skies" research and the "non-instrumental" roles of science be safeguarded, including the ability to assess and debate techno-scientific claims?

— Who should bear the financial risk of research and innovation?

— How should research priorities be decided?

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Q5. *Engaging the public and increasing public confidence in science and engineering policy.*

Q6. *The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy.*

Q7. *How government science and engineering policy should be scrutinised.*

19. The Government's commitment to the knowledge-based economy has major implications for the relationship between science, democracy and the economy as forms of good hitherto seen primarily as non-economic resources (culture, talent, knowledge, social relations) become forms of capital.[96] The notion of public-private partnership in the knowledge economy presumes that the interests of the market, state and citizens are the same and that no differences or conflicts of interest exist. However, conflicts between different interests are pervasive in the bioeconomy, and wealth creation is often directed at narrow, vested interests, rather than society as a whole. For example, there are strongly conflicting views about the future of food and agriculture, which imply radically different research agendas.[97] In addition, as the Harvard economist Gary Pisano has shown, the model of science as a business has been a failure: profitability in the medical biotech industry has been flat for over 30 years and without the biggest biotech firm, Amgen, the industry has made steady losses throughout its history, even before the current economic crisis.[98]

20. When the Government developed its policies on the knowledge economy, as a key element of the Third Way, Anthony Giddens stated: "*Science and technology used to be seen as outside politics, but this view has become obsolete … Decision-making in these contexts cannot be left to the "experts" but must involve politicians and citizens*".[99] However, although there has been some (belated) recognition of the need to engage the public more in decisions about science and technology—reflected, for example, in the 2004 launch of the "Sciencewise" programme—this has not yet impacted significantly on science and innovation policy or research priorities.

21. In GeneWatch UK's view, the Government's commitment to the "knowledge-based economy" and its failure to make transparent and accountable decisions in the area of investments in science and technology underpins the "*striking trust deficit*" identified in the Science Horizons Deliberative Panel report,[100] in which some people saw expert priorities for research investments as inevitably not the same as those of the average citizen. The 2007 Science Horizons report states that the discussions about science and technology *"brought to the surface numerous deep seated social concerns and policy themes*".[101] These included anxieties about privacy and surveillance, erosion of the human dimension in services and relationship building, future employment, trustworthiness of authorities, safety, fair access to technology and the potential for technologies to be misused. The concern that technology is being developed by industry and/or government in order to make profits, rather than in response to societal needs was "*a fairly common theme*" and some people expressed feeling a lack of control over the direction in which science and technology is heading. Trust in expert authorities in the abstract tended to be low and there was "*pervasive anxiety*" about potential abuse of technologies. It is also "*widely assumed that policy-makers in government and big business are not candid with citizens*".

22. The European Commission's Bureau of European Policy Advisors 2005 report of a qualitative study of the attitudes of EU citizens towards the renewed Lisbon Strategy also found: " … *that attitudes on the subject are extremely variable. They tend to be positive in some countries, at least for some population categories, but often negative, sceptical or reserved for the majority of other persons questioned.*"[102] People were doubtful about the credibility of investment in the knowledge-based economy as a recovery plan for a Europe that had failed over the course of the previous five years and: "*Responsibility for the mediocre situation was mainly placed with political leaders or governments and their erroneous policy choices and their mismanagement of public money*".

23. Many researchers have concluded that to address the dislocation of science from the public, there needs to be more civil society engagement with setting the research agenda and science and innovation policies. Participation is generally seen as furthering two aims—more democratic decisions and better ones. However, it is not a panacea and the notion of upstream engagement is a contested concept giving rise to its own dilemmas and tensions. Participation, whether upstream or not, is influenced by power dynamics and can either open up or close down debate.

[96] Andersson J (2007) Socializing capital, capitalizing the social: Contemporary social democracy and the knowledge economy. Centre for European Studies Working Paper #145. http://www.ces.fas.harvard.edu/publications/docs/pdfs/Andersson.pdf
[97] Lang T, Heasman M (2004) *Food wars: the global battle for mouths, minds and markets.* London, Earthscan.
[98] Pisano GP (2006) *Science Business: The promise, the reality, and the future of biotech.* Harvard Business School Press.
[99] Giddens A (1998) *The Third Way: The renewal of social democracy.* Polity Press, Cambridge.
[100] Dialogue by Design (2007) *Science Horizons: Deliberative Panel Report.* September 2007. http://www.sciencehorizons.org.uk/resources/sciencehorizons_deliberative_panel.pdf
[101] Dialogue by Design (2007) *Science Horizons, Strands 1–3: Summary Report.* September 2007. http://www.sciencehorizons.org.uk/resources/sciencehorizons_summary_report.pdf
[102] EC BEPA(2005) The attitudes of citizens of the European Union towards the renewed strategy of Lisbon: Qualitative study. September 2005. http://ec.europa.eu/dgs/policy_advisers/publications/docs/rapport_strategie_de_lisbonne_en.pdf

24. GeneWatch UK was recently involved in a EC-funded project which involved people from civil society organisations and academics in a study about participation in science.[103] Based on evidence gathered by interviewing members of civil society organisations (CSOs) in ten European countries the research found that, contrary to popular perception, CSOs that were engaged in debates about the development of agricultural biotechnology are not anti-science, but felt that current policy-making frameworks are disproportionately orientated towards the co-operation between science and industry, leaving other actors either under-represented or not represented at all. Although the original intention of the project was to focus on "good practice" in participation, the study found that CSOs believe themselves to be operating within a structure that fundamentally denies them opportunities for meaningful participation. The report identifies ten principles for effective participation.

25. In GeneWatch's view the issues identified in this submission can only be addressed by a major overhaul of the research funding system, which requires:

- More democratic decisions about research funding priorities and a more diverse research agenda;
- Greater accountability and scrutiny of research investment decisions: including economic assessments and appraisals, scrutiny of scientific and technical assumptions, and active steps to prevent political "entrapment" in research agendas based on false assumptions and misleading claims;
- Public engagement in setting research questions and priorities, including consideration of a variety of alternative approaches to addressing problems;
- Public engagement in research itself, involving closer co-operation between universities, communities and civil society organisations (for example, GeneWatch UK is currently involved in the EC-funded project "Facilitating Alternative Agro-Food Networks", which is an example of co-operative research[104]);
- More funding for research which does not necessarily benefit large corporations but may deliver other benefits including economic ones (for example, public health research, and research into improving organic and low-input farming methods);
- Fundamental reform of the science advisory system and the system for providing incentives for and assessment of research, including major reform of the patents system;
- Funding for "counter-expertise" and multi-disciplinary research which can identify long-term scientific uncertainties and regulatory gaps;
- A commitment to take public opinions into account in decisions about science and innovation, including methods to ensure full consideration of the broader social and economic issues associated with adopting particular technologies.

January 2009

Memorandum 23

Submission from Imperial College London

SUMMARY

- Science and engineering challenges in the 21st Century are global, involving "big science", work across traditional academic disciplines and require multidisciplinary, often multi-national approaches.
- Science and engineering policy-making must be underpinned by academic rigour and credibility and efforts should be made to improve this. Universities have a major role to play in enabling academic input and in understanding and resolving issues.
- The general public is increasingly aware of the importance of science and engineering in tackling important issues. Scientists and engineers should be incentivised to make their work accessible and understandable to the public.
- An evidence-based approach to policy-making is supported strongly and we agree with the wide consensus on the value of science in our society.
- The structures in place to deliver and scrutinise policy in Government are appropriate but need to be expanded, strengthened and further empowered where appropriate.

[103] Participatory Science and Scientific Participation: The role of Civil Society Organisations in decision-making about novel developments in biotechnologies. November 2008.
http://www.participationinscience.eu/psx2/final/PSX2_final%20report.pdf
[104] http://www.faanweb.eu/

— We support the Haldane Principle, since it enables flexibility and ensures that issues are addressed in the most transparent manner. However, it needs to be examined to ensure excellence is not compromised by regional policies.

— Regional issues can be dealt with in the context of national policies.

Our response to the specific questions posed in the inquiry is detailed in the paragraphs below:

Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science

1. We agree that science and engineering should be at the heart of policy making and believe that the current structure is appropriate but believe that it should be strengthened and empowered by, for example enabling National Academies and Universities to strengthen their evidence-based policy advice to Government.

2. We do not believe that a Department for Science would be in the best interests of science or the UK economy. Science increasingly addresses global challenges that are inter/multi-disciplinary and that are very closely linked to the innovation pipeline. In this way, science contributes to the global economy and will play its part in addressing the current financial crisis. It is therefore key that the Government Department which oversees science also has innovation on its agenda. A close link with education is also essential to enable high quality learning and teaching for the next generation of researchers and policy-makers. The creation of a separate Department of Science could silo science policy making.

How Government formulates science and engineering policy (strengths and weaknesses of the current system)

3. We support the current practice of a Chief Scientific Advisor being located in every Government Department and the work of the CSA should increasingly be mainstreamed.

4. We support the evidence-based approach to policy-making and welcome the increasing use of "think tanks" and wide consultation. Greater transparency, is to be encouraged, including publicising policy consultations more effectively and rewarding time and expertise given to contributing to policy making.

Whether the views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is assessed

5. Scientific policy making must have academic rigour and credibility. Efforts should be made to improve this. For example, we agree with the measures proposed in the recent submission from the Council for Science and Technology to DIUS on Academia and Public Policy Making (http://www.dius.gov.uk/policy/academia_and_public_policy.html). As a top UK University, Imperial College is pursuing a leading role in driving more proactive and productive links between its academics and Government decision makers. A pioneering example is the Grantham Institute for Climate Change at Imperial founded in 2007, with the twin goals of both generating the highest quality research on climate science and climate-driven change, and translating this research into sustainable technological, political and socio-economic responses to inform Government decision making. With its more recently formed sister institute at LSE, the Grantham Institute aims to provide solutions to the big policy challenges building on Imperial's scientific and technological expertise. Building on the Grantham model, Imperial has now established similar institutes in 3 other top priority areas: energy futures, global health and security.

6. The success of policy arising from consultations should be measured. This could be based on a Scorecard approach, such that clear objectives are set out at the beginning of the consultation and the outcomes reviewed against these objectives. Metrics could include the number and quality of responses received, the level of spread across stakeholders and, importantly, the extent to which the policy has taken account of the views put forward. Greater transparency of the way in which the consultation has influenced policy would be welcomed.

The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating

7. Whilst we recognise that local universities working with local companies is not a bad thing, we would not wish this to be at the expense of national and international collaborations. Science is global and should not be directed by narrow regional concerns.

8. There may, however, be a case for an over-riding regional issue to inform, or drive national science policy. For example, supporting and delivering the innovation pipeline within the research intensive, yet expensive M25 boundary may drive a national policy on the provision of incubator space.

9. We support the Haldane principle as it currently stands. We would welcome re-confirmation and re-statement of its definition and application.

Engaging the public and increasing public confidence in science and engineering policy

10. The public perception (often conveyed as mistrust) of science must be improved, such that it is seen as engaging and important. It must be seen as something which everyone can contribute to, at least in some way. Schools have an important role to play here.

11. It is essential that positive action is taken to ensure the public is better informed about science and engineering, how science and engineering impact on policy and how individuals can contribute and make a difference to policy development.

12. Whilst we recognise the value of the work undertaken by the Royal Society, other Learned Societies, museums etc, all organisations concerned with science and engineering should continue to work proactively with the public to tell them how exciting science and engineering is and to involve them in developing policy. For Universities, this might include establishing science and society and policy centres, holding more public lectures, developing roving exhibitions, holding open days, running consultations etc. Such activities must be funded and recognised and rewarded appropriately.

13. To this end, Imperial College London has recently funded and established a science and engineering policy centre that will take account of the views of its scientists and engineers and the wider community to contribute to Government policy-making.

The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy

14. All such organisations have an important role to play in developing science and engineering policy but it is important that advice is as independent as possible and that financial and inter-departmental funding considerations do not unduly influence the funding outcomes. Transparency of process and outcomes of their deliberations is also important.

15. Universities themselves have an important role in determining such policy since academic staff are at the cutting edge of research developments.

How government science and engineering policy should be scrutinised

16. The role of the Innovation, Universities and Skills Select Committee is crucial in the scrutiny of government science and engineering policy.

January 2009

Memorandum 24

Submission from the Council for Science and Technology

Introduction

1. The Council for Science and Technology (CST) is the Prime Minister's top-level independent advisory body on strategic science and technology policy issues.

2. The Council endorses the view that science and technology should be at the heart of policy-making and, in terms of its own position, does this by influencing Government through the advice it provides.

3. It is an advisory non-departmental public body which comes within the remit of the Department of Innovation, Universities and Skills (DIUS) but has a remit to provide advice across the whole of Government, and to First Ministers of Scotland and Wales. It was originally created in 1993, and reconstituted most recently in 2004. Its terms of reference are at Annex A.

4. The CST is co-chaired by the Government Chief Scientific Advisor, Professor John Beddington, and by Professor Dame Janet Finch,[105] together with 14 members drawn from a range of academic, business and charity backgrounds (see Annex B). It focuses on issues that cut across Government departments within the medium to long-term.

5. The CST's work programme is developed by its members in discussion with Government. It is the CST's aim that each project should have a sponsor Minister from within Government.

[105] Dame Janet is Vice-Chancellor of Keele University

6. CST provides its advice to Government through two main mechanisms: oral advice at meetings with Ministers, and letters or written reports either at the outcome of a particular project or during the course of the project. CST also responds to Government on specific consultations and policy developments.[106]

7. In undertaking projects CST draws on both the expertise of others as well as from its own membership in both gathering and interpreting the evidence base, and always seeks to present its analysis and recommendations to Government in a coherent and practical way. One of the strengths of a body such as CST is that it can range across a wide spectrum of science and technology issues, and their social implications.

Science and technology at the heart of Government

Influencing Ministers and Officials

8. The Council is the Prime Minister's Council for Science and Technology. It most recently met Prime Minister Gordon Brown in December 2008 to advise on infrastructure issues, public engagement and dialogue, and innovation policy. CST had previously met Tony Blair in November 2005 and June 2006 where the discussion covered energy policy, public engagement, ways of connecting the UK services sectors to the Science base, and the need for an active R&D-based public procurement policy. The last two topics contributed to the increased emphases on services sectors in innovation policy analysis and the introduction of the Small Business Research Initiative by Government.

9. The Council has developed an extremely close and productive relationship with DIUS Ministers, in particular with John Denham and Lord Drayson, where all sides recognise the importance of CST as an advisory body providing independent advice to Government.

10. It is important that the Council gets traction within Government for its advice and recommendations. The recent meeting with the Prime Minister has placed CST firmly on the No. 10 radar. The focus for science, technology and innovation within DIUS has meant that CST's impact and profile with Ministers has risen, compared to earlier arrangements where the Council was an advisory body located within a much larger department, the Department of Trade and Industry—where CST, and indeed science, technology and innovation, was one component of a much bigger whole. Having sponsor Ministers within Government departments for each CST project should mean that there is immediate and direct engagement with the department which will be taking forward the Council's recommendations.

11. While CST is well-known and influential in certain sections of Government—particularly those departments where science and technology are core components—getting traction for the Council more widely across Government has been rather patchy, and CST is actively considering ways in which this can be improved.

12. Given that the Council's remit is to give independent advice to Government, it is also important that CST has traction with, and influences, top officials within Whitehall as well as Government Ministers. The Council and its secretariat have developed close links in particular with the No. 10 Strategy Unit, and with senior officials across Government departments, for example at the Department for Business, Enterprise and Regulatory Reform, HM Treasury, the Department of Health, the Department of Transport and the Department for Environment, Food and Rural Affairs. Following recent machinery of Government changes, CST will be developing its relationship with the Department of Energy and Climate Change. Departmental Chief Scientific Advisors, and the Chief Scientific Advisors' Committee (CSAC) chaired by Professor John Beddington, are an important group of interlocutors—both collectively and individually—with whom CST engages extensively, as projects are being defined and during their execution. The Council also has a very extensive interaction with the Technology Strategy Board.

CST's networks in the science and engineering community

13. The Council recognises that in order to influence effectively Government policy, the members themselves need to use their extensive range of networks at the highest levels of business, academia and medical charities. This means the CST can draw on, and in turn influence, the leading science and engineering bodies such as the Royal Society, the Royal Academy of Engineering and other professional organisations, the science base bodies such as the Research Councils and RCUK,[107] a broad range of universities themselves as well as groups such as Universities UK,[108] business organisations such as the CBI,[109] and bodies such as the Academy of Medical Sciences, the Science and Innovation Forum, the Royal Commission on Environmental Pollution and CoRWM.[110] One example of the fruitfulness of these networks was the Council's report on *Strategic decision-making for technology policy* for which CST was able to draw on a broad range of external expertise often at very short notice.

[106] See for example the CST's response to: the consultation on the review of UK health research (the Cooksey Review); the reform of higher education research assessment and funding; and the consultation on revising the regulatory impact assessment, all of which are available on the CST website
[107] Research Councils UK, the umbrella organisation of Chief Executives of the Research Councils
[108] Comprising Vice-Chancellors of UK universities
[109] The Confederation of British Industry
[110] The Committee for Radioactive Waste Management

14. As part of their quarterly meetings, the Council as a whole has invited a broad range of individuals for discussions, including Government Ministers, Permanent Secretaries and senior officials, the President of the Royal Society, Chief Scientists, Chief Executives of the Research Councils, EU Commissioner Potočnik, the Permanent Secretary at No. 10, members of the Business Council for Britain and other senior business and Government representatives.

15. These more informal contacts have a dual purpose. They provide opportunities for CST to influence policy-making by more private input of advice to Ministers and senior officials. At the same time they also are opportunities where CST itself can, in discussion with others, develop thoughts about the direction of its own work. On two occasions major projects have been commissioned by Ministers as a result of these discussions. At a dinner in December 2006 Alistair Darling, then Secretary of State at the DTI, asked the CST to undertake a major piece of work which resulted in the report on *Strategic Decision Making for Technology Policy*. Similarly at another dinner in November 2007 John Denham initiated discussion about CST undertaking the project which resulted in the report *How Academia and Government can work together.*

CST's impact and reach

16. The Council's view is that its impact with Government and its wider stakeholders has grown significantly—and particularly over the last two years—but that more still needs to be done to ensure that its advice and recommendations are being picked up and implemented consistently at the heart of Government.

17. There are certainly instances where the Council's influence is clear and direct, and others where it is indirect. The Council, in its 2005 report on *Personal Information*[111], was one of the first groups to highlight the need to balance very carefully the improvements stemming from better use of IT systems and the need to safeguard the privacy of personal information. The report led to Government setting up a review looking into the way personal information in the public and private sector was shared and protected. The review, published in June 2008, was carried out by CST member Sir Mark Walport (who had led the CST project) and the Information Commissioner, Richard Thomas.

18. The Council's review of the Government's progress on *Nanotechnology policy*[112] highlighted the need for more work on the toxicology, health and environmental effects of nanomaterials to assess risks, reassure the public and put in place regulation as necessary. It was influential in the creation of a cross-Government group of Ministers on nanotechnology with responsibility for the research base, innovation, health and safety and the environment, to give strategic direction and maintain commitment to the Government's programme of work. Following the review, a number of actions were taken to address the Council's recommendations: for example, the Department of Health committed to providing £1.25 million over five years to support the health-related research, and in February 2008 the Ministerial group issued a statement on what was needed to ensure the responsible development of nanotechnologies.

19. The launch of the Sciencewise Expert Resource Centre for Public Dialogue in Science and Technology was in direct response to the Council's recommendation to create a corporate memory of engagement practice in its *Policy through dialogue report*.

20. John Denham has accepted the recommendations of CST's recent report *How academia and Government can work together*, which he commissioned in February 2008 as a component of the Higher Education Debate. The Government Office for Science is in the lead in taking forward the Council's recommendations. As an example of the extent of the CST's reach during this project, formulating the evidence base involved discussions with over 50 leading individuals and organisations from both academia and Government.

21. During 2007 Alistair Darling, when he was Secretary of State for Trade and Industry, asked CST to identify a small number of crucial technologies which Government should focus on over the next five years. The Council's report on *Strategic decision-making for technology policy* highlighted six key technologies, which included a case study on Plastic Electronics, which helped raise the profile of this whole area, not least through the IUSS Select Committee report on Engineering, where CST members were called to give evidence.

22. Further details on the range of projects which CST has undertaken are at Annex C.

CST's public profile

23. The Council has consciously not sought a high public profile through the media or elsewhere. Nevertheless, a number of CST's reports have had significant press coverage—for example the report on *Personal Information*, which was picked up by *Channel 4 News* and *Newsnight* and in the press more generally; and the Council's *Nanotechnology policy* which had widespread press coverage including on the *Today* programme.

[111] CST's report: *Better use of personal information: opportunities and risks*
[112] CST's report: *Nanosciences and nanotechnologies: a review of Government's progress on its policy commitments*

CST's current programme

24. The Council is currently undertaking a project on *Water supply technologies* and is also starting to develop an overarching project on *National infrastructure*. The latter is at a very early stage of development but has received very positive support in discussions with the Prime Minister, DIUS Ministers, and officials. It will draw both on the expertise developed through the current project on *Water supply technologies*, and on an earlier project on *An electricity supply strategy for the UK*.

25. The *Water technologies* project is investigating the level of research and development within the water sector and considering what more could be done to stimulate innovation, as well as looking at best practice in the use of technology.

26. CST will also be looking to return to a project on *Cross-disciplinary research* where the Council is investigating mechanisms to encourage cross-disciplinary research and development (R&D), in the UK and abroad, including the identification of good practice that can be applied more widely to promote cross-disciplinary R&D.

27. CST has also recently undertaken a forward planning exercise for potential future projects, which involved not only informal discussion with Ministers and senior officials, but also a meeting with a panel of experts drawn from elsewhere in government and from Learned Societies, who were asked to scrutinise initial ideas and give feedback. This exercise is illustrative of CST's ways of working, drawing on networks of support and advice, which are freely given to the Government's most senior advisory body for science and technology.

January 2009

Annex A

CST TERMS OF REFERENCE

CST's terms of reference are:

to advise the Prime Minister and the First Ministers of Scotland and Wales on the strategic policies and framework for:

- sustaining and developing science, engineering and technology (SET) in the UK, and promoting international co-operation in SET;
- fostering the practice and perception of science, engineering and technology as an integral part of the culture of the UK;
- promoting excellence in SET education;
- making more effective use of research and scientific advice in the development and delivery of policy and public services across Government; and
- promoting SET-based innovation in business and the public services to promote the sustainable development of the UK economy, the health and quality of life of UK citizens, and global sustainable development

The Council will work on cross-cutting issues of strategic importance, taking a medium to longer term approach. In developing its advice it will take into account the cultural, economic, environmental, ethical and social context of developments in SET.

Annex B

CST MEMBERS

Professor John Beddington—Government Chief Scientific Adviser. CST co-chair

Professor Dame Janet Finch—Vice-Chancellor, University of Keele. CST co-chair

Professor Geoffrey Boulton—Vice Principal and Regius Professor of Geology and Mineralogy, University of Edinburgh; Executive Secretary of the Royal Society of Edinburgh.

Professor Peter Davies—previously Chief Economist BP Ltd

Professor Alan Gilbert—President, University of Manchester

Professor Dame Wendy Hall—Professor of Computer Science, University of Southampton.

Dr Hermann Hauser—Venture Capitalist: co-founder of Amadeus Capital Partners Ltd.

Professor Alan Hughes—Director of the Centre for Business Research and Professor of Enterprise Studies at the Judge Business School, University of Cambridge.

Dr Sue Ion—Member of Engineering and Physical Sciences Research Council, previously Executive Director of Technology, British Nuclear Fuels plc.

Sir Paul Nurse—Nobel Prize-winner and President, Rockefeller University, New York.

Sir Keith Peters—Emeritus Regius Professor of Physic at the University of Cambridge and previously President of the Academy of Medical Sciences

Dr Raj Rajagopal—formerly Chief Executive, BOC Edwards and Executive Director, BOC Group plc.

Dr Philip Ruffles—formerly Director of Engineering and Technology Rolls Royce plc and former Chair of the RAE Engineering Policy Committee

Professor Michael Sterling—Vice-Chancellor, University of Birmingham.

Professor Kathy Sykes—Professor of Sciences and Society, Bristol University

Sir Mark Walport—Director, Wellcome Trust.

Annex C

CST REPORTS

How academia and Government can work together

1. CST were asked by John Denham to investigate ways in which the interaction between academia and policy makers in Government could be improved.

2. The main message from CST was that academics and policy makers have a healthy level of engagement and goodwill, but more needed to be done to strengthen the relationship to ensure informed, evidence-based policy making. These include world-class exchange mechanisms between academics and policy-makers; strengthening the roles of Departmental Chief Scientists; encouraging universities to act more like consultancy organisations; and devising better mechanisms to rate, value and reward the relationship.

Strategic decision making for technology policy

3. CST developed a priority-setting framework for decision-making that could be used by Government to make better choices between competing areas for technology funding.

4. Using this framework, CST identified six key technology areas which extra resource from Government would deliver returns to the UK within a five-year timeframe: Carbon Capture and Storage, Disaster Mitigation Technologies, Low Carbon Distribution Networks for Electricity Supply, Medical Devices, E-Health, and Plastic Electronics.

Public Engagement: policy through dialogue

5. CST's *Policy through dialogue* report encouraged government to do more to engage the public in the development of science and technology-based policies, or risk jeopardising the economic and social gains expected from the ten-year investment framework for science and innovation.

6. The Council has responded to the 2008 Government consultation on Science and Society and will shortly be publishing a review it carried out in parallel on progress in embedding dialogue and engagement mechanisms in Government departments. Although the review identifies examples of good practice—in areas such as radioactive waste management and food standards—and whilst the UK has a competitive advantage over most countries in public dialogue, more is needed in terms of Government using best practice in dialogue across departments. There is a need to adopt an explicit framework for public dialogue which is responsive to different circumstances, and to prioritise areas for dialogue, particularly on longstanding "legacy" issues. Nanotechnology is an area where public engagement and strategic research need to be pursued in parallel.

Pathways to the future : the early career of researchers in the UK

7. CST made recommendations on how the management of researchers at the start of their careers could be improved in order to make a research career a more attractive option. It recommendrd the development of a national framework for research careers, and giving research staff greater independence at an earlier stage. It was an important component to help RCUK revise its Concordat on research.

8. CST is one of the official supporters of the Concordat. The Council believes that the seven key principles listed in the revised Concordat are important as a single unambiguous statement of the expectations and responsibilities placed on researchers, and on their managers, employers and funding bodies, and that having a robust implementation plan will be crucial for success.

Nanosciences and nanotechnologies: a review of Government's progress on its policy commitments

9. The Review by the CST concluded that the Government had made good progress in many areas, including support for and dialogue with industry and international engagement, and on metrology and support for standards, but that it must commission more work on the toxicology, health and environmental effects of nanomaterials to assess risks, reassure the public and put in place regulation as necessary.

Health Impacts—a strategy across Government

10. The CST's recommendations emphasised the need to embed health considerations at a very early stage of policy development in a common and consistent way across Government; and address the quality and availability of the evidence and the need for public engagement and dialogue.

Services sector and public procurement

11. CST set out the challenge for Government to understand the needs of services sector companies, and to foster innovation by finding ways to connect them to the research base.

12. The Council also set out how Government can better meet its own objectives and stimulate innovation in business through better use of public procurement.

Better use of personal information: opportunities and risks

13. CST's report set out how the use of personal data by government offers enormous benefits, with the potential to create more efficient and accessible public services, but that the risks must be addressed in order to secure these benefits. Key recommendations included the need for engagement with the public and civil society groups, regulatory and governance frameworks to minimise risks, and the need for research into privacy enhancing technologies.

An electricity supply strategy for the UK

14. CST's report recommended immediate investment in large scale, low-carbon, energy generation facilities to meet the Government's carbon dioxide reduction targets; the need to keep the nuclear option open and place more emphasis on carbon sequestration and tidal power.

15. It also recommended greater investment in R&D aimed at new and renewable energy sources, energy management and storage; improving the supply and training of skilled workers in the UK; investment in the development of the national grid to facilitate distributed and diverse generation and the need to address regulatory issues arising from this form of generation.

Memorandum 25

Submission from the Arts & Humanities Research Council (AHRC)

SUMMARY OF KEY POINTS

— Research in the arts and humanities must be at the heart of government policy. We cannot confront the most pressing global policy challenges today without tapping into the expertise of arts and humanities researchers.

— We recommend the inclusion of the word "research" in the title of the Minister of State for Science and Innovation. The AHRC reiterates the RCUK response to this inquiry, where it warns that the creation of a Department for Science (and Research) could potentially lead to science and research issues becoming isolated from the day to day concerns of individual Government departments.

— Inclusion of arts and humanities expertise is in line with a wide array of existing guidelines, advice and practice in policymaking. For example, Chief Scientific Adviser guidance for the use of research in policymaking recommends using "philosophical and wider social research" where appropriate.

— We believe the Council for Science and Technology (CST) has carried out a useful function in encouraging all research—including the arts and humanities—to play its full part in Government policy.

— Interaction between academia and policymakers could be facilitated by making researchers more aware of the evidence needs of government. All government departments should publish their research priorities and needs.

— We ask the Committee to consider ways to encourage greater coordination of all policy-relevant research to encourage joined-up Government and recommend the creation of an Arts and Humanities Chief Adviser.

— The IUSS Select Committee plays an exemplary role in scrutinising science and engineering policy. We believe that the Committee has a valuable and influential role in overseeing arts and humanities research, including its role in Government evidence-based policy.

Introduction

1. The AHRC welcomes this opportunity to share its views on putting science and engineering at the heart of Government policy, and looks forward to working with the Committee on matters relating to research in the future.

2. The AHRC supports research within a huge subject domain from traditional humanities subjects, such as history, philosophy, theology, modern languages and English literature, to the creative and performing arts. The AHRC funds research and postgraduate study within the UK's Higher Education Institutions and in a number of Independent Research Organisations, typically national museums and galleries. In addition, the AHRC is involved in funding and shaping numerous collaborative research programmes with other Research Councils and organisations such as the Technology Strategy Board, and in fostering the economic impact of arts and humanities research.

3. Research in the arts and humanities must be at the heart of government policy. Without it, evidence-based policymaking will be impoverished, bereft of ethical, cultural, legal, philosophical and historical dimensions. The lessons of GM, BSE, or MMR are that technological fixes are not enough. We must understand the complex social and cultural aspects of these challenges. As a 2001 Council for Science and Technology report on arts and humanities research concluded: "science and technology policy is concerned to a striking extent with questions which engage both the sciences and the arts and humanities … arts and humanities and science and technology need each other".[113]

4. We cannot confront the most pressing global challenges today without tapping into an ethical, cultural and historical understanding of our world. Whether it is globalisation or improving our economic and emotional well being, adjusting to ageing and the increasing diversity of the population, or the renewal of Britain's constitution and democratic institutions, all these complex issues require expertise across all subject domains. The arts and humanities community can play a vital role in helping us understand these problems.[114]

Background to the AHRC Submission

5. The AHRC's response to this inquiry is produced in conjunction with Research Councils UK (RCUK). As well as contributing to the cross-Council response, we agreed with our RCUK colleagues to submit a parallel AHRC document. The AHRC submission is intended to give greater detail and evidence about specific issues relating directly to arts and humanities research, and to argue for our explicit inclusion within any discussion of the UK's research capability and contributions that the research base make towards the development of public policy. To avoid duplication, we have tried to avoid repeating the points made in the RCUK response but we would like to stress that we endorse all of the recommendations made in the RCUK submission.

6. The AHRC submission has taken "government policy" to mean all government policy, not just topics directly referring to science, technology and engineering issues.

7. To highlight the public policy impact of arts and humanities research, we consulted some of our community for a selection of examples of research that has had a tangible policy impact. We include a short selection of some of the 14 case studies in this document. All of the examples can all be found on our website: http://www.ahrc.ac.uk/About/Policy

Humanities and human rights.

Legal research remains at the heart of 60 years of landmark human rights law and institutions. The incorporation of the European Convention on Human Rights into domestic UK law, through the Human Rights Act 1998, has led to greater judicial reliance upon academic commentary. The expertise of the academy is a valuable asset, with academics providing an advisory capacity for Government, judges, practitioners and public authorities. For example, the theories of Piet Eeckhout, Professor of European Law at King's College London and an Associate Member of Matrix Chambers, were adopted in a recent landmark European Court of Justice case involving the UN Security Council.

[113] *Imagination and Understanding: A Report on the Arts and Humanities in Relation to Science and Technology* (Council for Science and Technology, 2001).

[114] *See Realising Britain's Potential; Future Strategic Challenges for Britain* (The Strategy Unit, Cabinet Office, February 2008) for an overview of cross-cutting priorities for the UK Government.

8. Across Government and opinion formers, there is a growing commitment to arts and humanities research in policymaking. For example, the Chief Scientific Adviser guidance for the use of research in policymaking recommends using "philosophical and wider social research" where appropriate.[115] Similarly, a report last year by the European Commission promoted the use of the humanities in policymaking:

> "There is a vast store of new knowledge and information in the results of the projects funded in the area of the socio-economic sciences and humanities under the European Framework Programmes of Research. Harnessing this information in order to inform policy-making is a major priority".[116]

9. Recent reports have highlighted ways to improve the relationship between academia and Government. The 2008 British Academy report *Punching our Weight,* from a group chaired by the AHRC's chairman Professor Sir Alan Wilson, makes a series of recommendations for how arts, humanities and social science researchers can actively increase and improve collaboration with policy makers.[117] The Council for Science and Technology's (CST) Report on *How Academia and Government can work together* also made numerous recommendations about how Government and academia can improve and develop engagement.[118] Our submission builds on these reports.

Specific Responses to the Committee's Points

Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science.

10. We are not persuaded that there is a need for a new Department for Science. The AHRC reiterates the RCUK response to this inquiry, where it warns that the creation of a Department for Science (and Research) could potentially lead to science and research issues becoming isolated from the day to day concerns of individual Government departments. Evidence-based policymaking should be integral to the work of all public bodies and not the responsibility of one individual department.

11. We are encouraged that Lord Drayson's recent appointment as Minister of State for Science and Innovation has been made at Cabinet level. We recommend the inclusion of the word "research" in the Minister's title, in order to reflect the Government's ongoing commitment to supporting the broad spectrum of science and research within the UK. This further reflects Conclusion 1 of this Committee's inquiry into the science budget allocations:

> "Given the range of programmes and disciplines covered by the Science Budget, the name is somewhat misleading, especially since the transfer of AHRC into the budget in 2005. We recommend that DIUS change the name of the Science Budget to the Science and Research Budget to reflect the inclusion of arts, humanities and knowledge transfer which we note matches the welcome change in title of the DIUS official in charge of the budget to the Director General for Science and Research".[119]

12. We believe the CST carries out a useful function in encouraging all research—including the arts and humanities—to play its full part in Government policy. The CST's recent report on *How Academia and Government can Work Together* made helpful recommendations about how Government should make greater use of various bodies (including the AHRC) to enhance access to valuable sources of external academic capacity.[120] We look forward to seeing the Government's response to this report. In the lead up to the creation of the AHRC in 2005, the CST also published a valuable report on the role of arts and humanities research in science and technology policy.[121]

13. We cannot comment on the work of the Cabinet Sub-Committee on Science and Innovation as their work is not in the public domain. We appreciate that Cabinet papers are confidential and cannot be made available through the Freedom of Information Act.[122] We do, however, think it should be in the public interest to know more about the work of the Committee and whether the research community can assist the Committee in any way.

> *Policy advice on Islam and radicalization.*
>
> The AHRC/ESRC Religion and Society Research Programme has included, among a large number of projects, work with Muslim groups and the Metropolitan Police to challenge religiously endorsed violence. The £12.3 million programme brings together arts and humanities scholars with social scientists, to address complex and topical issues of belief, culture, society and religion. In 2007 the programme director, Professor Linda Woodhead, was a member of the commissioning panel on the joint ESRC/AHRC/Foreign and Commonwealth Office Programme on *Islam, Radicalization and Violence—A Critical Reassessment*.

[115] *Guidelines on Scientific Analysis in Policy Making* (HM Government, 2005).
[116] *Scientific Evidence for Policy Making, European Commission 2008*.
[117] *Punching our Weight; The Humanities and Social Science4s in Public Policy Making* (British Academy, 2008).
[118] *How Academia and Government Can Work Together* (Council for Science and Technology, 2008).
[119] *Science Budget Allocations; Fourth Report Innovation* (Universities, Science and Skills Committee, House of Commons 2008).
[120] *How Academia and Government Can Work Together* (Council for Science and Technology, 2008).
[121] *Imagination And Understanding: the Arts and Humanities in Relation to Science And Technology* (Council for Science and Technology, 2001).
[122] *A Guide to Cabinet and Cabinet Committee Business* (Cabinet Office Secretariat, 2008).

How Government formulates science and engineering policy (strengths and weaknesses of the current system)

14. The AHRC also stresses that any discussion of science and engineering policy should include the arts and humanities so as to reflect the broad spectrum of research supported by the Science and Research Budget. In this respect we draw the Committee's attention to the fact that at present the AHRC is currently involved in funding collaborative research with the other Research Councils (except the Science and Technology Facilities Council).

15. The AHRC maintains its commitment to supporting world-class research—underpinned by the principles of peer review—which directly helps to maintain the UK's position as a world-leader in the field of academic research. This position can only be strengthened by more robust and explicit inclusion of the wide-ranging benefits that arts and humanities research can bring to the UK's science and research policy.

16. The benefits can be both direct and indirect. The 2008 British Academy report on fostering academic policy advice discusses the direct contribution made by certain disciplines, and goes on to state that "for other disciplines (literary, cultural, philosophical and historical) the contributions can be less direct, but no less important, increasing understanding and knowledge, along with subtle changes in attitudes and assumptions".[123] We welcome this report's recommendations that Government departments should publish departmental research priorities and facilitate increased dialogue with the academic community to build upon existing engagement.

Gender, sexuality and public policy.

The AHRC Centre for Law, Gender and Sexuality at Keele University has made 15 separate responses to Government policy consultations since 2004, and has as one its central strategic aims to "promote the exchange of ideas on matters relating to policy, practice, and activism". Consultation subjects the centre has responded on include welfare reform, hybrid embryos, human trafficking, discrimination law, forced marriage and rape law reform.

17. The Council for Science and Technology's 2001 report *Imagination and Understanding* made the important point that the greatest challenges facing the UK require engagement between the arts, humanities, science and technology.[124] The report argues that this is because science and technology policy is "concerned to a striking extent with questions which engage both the sciences and the arts and humanities". The CST study concludes that the development of research policy would be "strengthened by the participation of the arts and humanities in these discussions … including the discussion of new information and communication strategies, and of their consequences for UK and global society". This would build upon the aims stated within the 1999 White Paper *Modernising Government,* to make policy-making more joined up, strategic and forward looking—explicitly calling for better use of evidence and research in policy making.[125] We hope that that the IUSS Committee will recognise and build on these recommendations in their inquiry.

18. We ask the Committee to consider ways to encourage greater coordination of all research for evidence-based policy making within Government. In this context, we would like to recommend appointing a Chief Adviser for the Arts and Humanities with a strong track record in bringing research to bear on the development of public policy; ideally with a cross Government remit. RAE 2008 showed that arts and humanities researchers represent 27% of the UK's active researchers and scored better than any other area in terms of 4* contribution, a position for which the AHRC has independent empirical support in its analysis of a sample of international journals that shows the UK's arts and humanities researchers produce almost as much world-class research as the USA, with six times our population. Why should Government not benefit from the impact these researchers should make on policy formulation and implementation, as mediated by a Chief Adviser for the Arts and Humanities?

19. Interaction between academia and policymakers could be facilitated by making researchers more aware of the evidence needs of government. The 2008 British Academy report on policy making recommended that all government departments publish their research priorities and needs to "facilitate interaction and dialogue with the academic research community".[126] A number of departments already do this but this should be implemented across Government.

Policy lessons from history.

Prime Minister Gordon Brown invited historian Professor Sir David Cannadine to review Government secrecy rules. Announced by the PM in 2007, the study examines a possible relaxation of the 30-years rule on access to government documents. The study also involves *Daily Mail* editor Paul Dacre and Sir Joe Pilling, a former Permanent Secretary in Northern Ireland. David Cannadine is also on the advisory board of the History and Policy think tank, a group of historians, MPs and journalists. The results of the secrecy study will be made public in January 2008.

[123] *Punching our Weight; The Humanities and Social Science4s in Public Policy Making* (British Academy, 2008).
[124] *Imagination And Understanding: the Arts and Humanities in Relation to Science And Technology* (Council for Science and Technology, 2008).
[125] *The Modernising Government White Paper* (Cabinet Office, 1999).
[126] *Punching Our Weight; The Humanities and Social Sciences in Public Policy Making (*British Academy 2008).

Whether the views of the science and engineering community are, or should be, central to the formulation of Government policy, and how the success of any consultation is assessed

20. The views of the entire research community should be central to the formulation of Government policy. Not just science and engineering—every discipline can play a part. We strongly endorse the Government guidance on scientific analysis in policymaking which encourages the use of different subjects relevant to the specific policy challenge:

> "the potential for advice to be strengthened by harnessing evidence from all disciplines should not be discounted, particularly in areas of public concern … . The balance of research methods used to generate the data will also depend upon the issue in question. Research methods include … philosophical and wider social research".[127]

21. The AHRC's funding comes from the Science and Research Budget, and many of the challenges currently facing the UK and the world present distinct opportunities for interdisciplinary collaboration in the search for solutions; in particular we refer to the 2008 Cabinet Office report on strategic priorities for Britain.[128]

22. Policy-relevant research funded by the Research Councils frequently cuts across disciplinary boundaries. Advice and research for policymakers do not fit into a neat category of science and engineering. The AHRC is actively involved in collaborative research programmes with every other Research Council (with, so far, the exception of the STFC). This ensures arts and humanities research inputs into fields as diverse as ageing, synthetic biology, science and heritage, knowledge transfer, environmental change, the digital economy, museums and galleries, language based area studies and also lifelong health and wellbeing.

> *Ethics in biology and medicine.*
>
> The Nuffield Council on Bioethics is an exemplar of the effective use of different disciplines in policy advice on new developments in biology and medicine. As well as scientists and medical practicioners, the Council includes experts from the humanities such as lawyers, philosophers, and theologians who have worked on topics ranging from xenotransplantation to stem cell research. The Council's diversity of expertise is a major contributing factor to their policy impact.

23. Chief Scientific Advisers in Government departments play a valuable role in ensuring that evidence from research is fed into policy formulation. There is, however, a diverse array of individuals responsible for research within Government departments and agencies, including Chief Statisticians, Chief Economists, Chief Social Researchers and Chief Scientific Advisers. There are also 1,900 lawyers across Government whose work needs to be informed by the latest legal research and practice. We ask the Committee to consider ways to encourage greater coordination of all research to encourage joined-up Government and bring together all relevant expertise for the policy challenges of the twenty first century.

24. The effectiveness of consulting the research community should be assessed by follow-up studies and focus groups of academic contributors and government policy officials. Were the academics listened to by officials or was their advice ignored? Did the policy advice from the academics meet the needs of officials? Where and how did responses have an impact? It would be helpful for the academic experts to obtain feedback so that they can learn from mistakes and successes. Positive feedback can also assist scholars who are increasingly being asked by their funders for evidence of wider economic, social, cultural and policy impacts.

> *Understanding terrorism.*
>
> The Home Office commissioned Professor Kim Knott, the Director of the AHRC's Diasporas, Migration and Identities Research Programme to conduct a review of arts and humanities research literature relating to *The Roots, Practices and Consequences of Terrorism*. The review focused on the importance of culture and identity for understanding the roots, practises and consequences of terrorism. The study provided a framework of contributory factors and recommendations for future research and policy implications.

The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating

25. Like all Research Councils, the AHRC has a UK-wide remit and we do not allocate funds according to regional or devolved policies. Our Royal Charter does, however, have an explicit remit to promote and support "the exploitation of research outcomes and research relating to cultural aspects of the different parts

[127] *Guidelines on Scientific Analysis in Policy Making* (HM Government, 2005).
[128] *Realising Our Potential; Future Strategic Challenges for Britain* (Cabinet Office 2008).

of our United Kingdom." Arts and humanities research plays a central role in understanding the cultures, language and history of the interlocking parts of the UK.[129]

The morality of climate change policies.

Professor John Broome, Professor of Moral Philosophy, Oxford University (a member of the AHRC peer review college and former AHRC award holder), was commissioned as part of HM Treasury's Stern Review into the Economics of Climate Change to write on *Valuing policies in response to climate change: some ethical issues*.

Engaging the public and increasing public confidence in science and engineering policy

26. Public engagement must involved a greater understanding of the social and cultural aspects of science and engineering policy and move "up stream" at the earliest stages of policy formulation. We commend the breadth of the DIUS strategy A *Vision for Science and Society* (2008) which recognised the role of all disciplines in wider public and policy engagement for the benefit of society. The preface mentions that "by science we mean all-encompassing knowledge based on scholarship and research … including the arts and humanities."

The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy

27. The AHRC has no additional information to add to the RCUK response to this question.

Policies to prevent torture.

The Ministry of Justice approached the AHRC-project *Evaluating the Effectiveness of the National Institutions under the Optional Protocol to the UN Convention on Torture* to hold workshops involving various stakeholders, including Her Majesty's Inspectorate of Prisons. Led by Professor Rachel Murray from the University of Bristol, they have also worked with the UN Sub-Committee for the Prevention of Torture and the Foreign and Commonwealth Office on the global adoption of the protocol.

How Government science and engineering policy should be scrutinised

28. The IUSS Select Committee already plays a valuable role in scrutinising science and engineering policy. We believe that the Committee has an influential role in overseeing arts and humanities research, bolstered by the diverse expertise of the Committee's members that includes graduates in philosophy and classics, and a former editor of *History Today*.

December 2008

Memorandum 26

Submission from the John Innes Centre

SUMMARY

John Innes Centre

- supports the concept of a Department for Science, despite the risks
- would welcome further development of cross-department policy formation and cross-council approaches to funding
- believes that UK science career structure is weak and policy needs to be addressed
- welcomes the Government's efforts to consult more widely in policy formulation and would welcome the opportunity to contribute to a broader range of research issues
- agrees that the Haldane[130] principle should continue to be embraced
- supports the widest engagement in policy development, driven by a central vision of what the UK can best deliver, based upon its strengths within publically-funded organisations.

[129] *Arts and Humanities Research Council Royal Charter* (AHRC, 2005).
[130] http://en.wikipedia.org/wiki/Haldane_principle

Q1. *Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science*

1. The John Innes Centre welcomes the recent appointment of a Cabinet-level Science Minister.

2. Science funding policy does not yet adequately reflect science as the cornerstone of the knowledge based economy on which the nation's future prosperity depends.

3. A Department for Science is needed to sustain and extend current scientific activity to the benefit of UK GNP. However, there is a risk that the creation of a Department for Science could lessen the perceived importance of science more broadly in Government.

4. The inclusion of "Science" in the title of DIUS would be welcome.

5. Attention should focus on making the relatively new departmental structure and other existing structures as effective as possible ensuring that science and research feed into evidence-based policy making.

Q2. *How Government formulates science and engineering policy (strengths and weaknesses of the current system)*

6. JIC acknowledges that Government has been largely supportive of science through improved funding, and stimulation of open debate of scientific issues in relation to society.

7. JIC would welcome the development of mechanisms for effective cross-departmental coordination of policies, which draw on the wider research base. Government has a key role in fostering greater inter-council co-operation in funding large scientific questions.

8. Government needs to take into account the fact that cycles for scientific delivery are much longer than political cycles and, having agreed policy, needs to plan accordingly for continuity of funding.

9. Funding policy is too often directed towards issues of international popularity without necessarily giving thought to what the UK can best deliver—playing to our strengths.

10. The UK science career structure is weak and policy needs to be addressed; PhD studentships need to be more attractive, to attract and retain the brightest and best; the Postdoctoral research career structure also needs addressing.

11. Government needs to give higher priority to issues of food security through programmes of development in plant biotechnology and plant breeding.

Q3. *Whether the views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is assessed*

12. JIC welcomes the Government's efforts to consult more widely in policy formulation and would welcome the opportunity to contribute to a broader range of research issues.

13. Science is complex and costly. Hence decisions on scientific funding should be informed directly through close consultation with scientists. UK Government should be open to international scientific opinion on proposed scientific policy.

14. Consultations with the science and engineering community need to be better coordinated, giving time for considered input. Improved efforts should be made to ensure that stakeholders are contacted, with clarity on what information they would like.

15. Government should make clear how the responses to their consultations have been used to inform policy development.

16. Ultimately the success of such consultations will be shown by our ability to deliver societal and economic improvements, but the long incubation times should be recognised.

Q4. *The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating*

17. The Haldane principle should continue to be embraced—JIC believes that scientists (in the guise of research councils) rather than politicians should lead in decisions on priorities of research funding expenditure.

18. "Blue skies" research capabilities should continue to be protected—balancing curiosity-driven research with economic impact drivers.

19. Fundamental research and maintaining a world leading science base are major functions of the Research Councils and this should be retained. In the UK Government Departments fund science to inform policy development but unlike the US there is little Departmental funding of science to help deliver policy goals. For example US-DOE and US-DA fund targeted plant genome research for priority food and energy species. This does not happen in the UK and should, but not at the expense of the Research Councils.

20. Funding should be linked to excellence as judged by peer review

21. In the area of agriculture, regional and national have complementary aims and values. International collaboration is at the heart of science and should be encouraged. Agriculture is especially tailored to local climatic and soil conditions. Hence, crop development will always need to have a local flavour.

Q5. *Engaging the public and increasing public confidence in science and engineering policy*

22. DIUS recently consulted on *"A Vision for Science and Society: a consultation on developing a new strategy for the UK"*. JIC's communications professionals responded to the consultation. JIC looks forward to seeing the report from the consultation and hopes that this will lead to a strategy in which DIUS leads the community and other Government departments, and provides incentives for partners to work together.

23. JIC believes that bench-scientists are not always the best communicators of the bigger issues. Excessive reliance on research scientists to influence wider public thinking is not necessarily a strong policy.

24. JIC does, however, have an active role in engaging with public audiences on a variety of levels, both local and national, and takes its responsibilities in delivering accurate information extremely seriously.

Q6. *The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy*

25. The widest engagement is positive but this should be driven by a central vision of what the UK can best deliver, based upon its strengths within publically-funded organisations.

Q7. *How government science and engineering policy should be scrutinized*

26. All appropriate Parliamentary Select Committees should continue their role of scrutiny of policy, an approach which should be cross-cutting and encourage combined enquiries (more than one committee involved) echoing our view expressed in para. 6 above

27. Policy success will be measured by the well recognised outputs of, international recognition, delivery to society and industry, and economic growth over a long timescale.

January 2009

Memorandum 27

Submission from The Royal Society

SUMMARY

— When appointing his scientific advisory team, Barack Obama said:

"The truth is that promoting science isn't just about providing resources—it's about protecting free and open inquiry. It's about ensuring that facts and evidence are never twisted or obscured by politics or ideology. It's about listening to what our scientists have to say, even when it's inconvenient—especially when it's inconvenient".

The provision of independent advice to Government has always been an important function of the Royal Society. We therefore welcome the Committee's inquiry into the relationship between science, engineering and policymaking in the UK.

— A number of initiatives in recent years, such as the appointment of Chief Scientific Advisers from outside Government and the creation of independent departmental scientific advisory committees, have improved the quality of science and engineering advice at the heart of policymaking. It is important that this Committee and others keep this situation under review, particularly in light of any changes in the wider political and economic environment.

— It is surprising that DIUS is one of the few Departments with science spending not to have an independent advisory group to guide and comment on its policy in this area. We believe that when allocating the science budget, the Director General of Science and Research (DGSR) should be advised by an independent group of experts, who can identify emerging areas of science or initiatives that might require funding, as well as advising on the wider consequences of particular funding decisions.

— We do not support sections of the science budget being earmarked for particular regions, except where this allocation reflects scientific excellence. The key to a region's success is less its ability to create or develop its own science and technology base, and more about its capacity to absorb and

capitalise on the best science and technology, drawn from a variety of national and international sources. Rather than a debate about what Haldane meant in 1918, we need a better understanding about the way in which the Government now interprets the Haldane Principle.

— We believe that independent advice from the scientific community facilitated by the Academies and Learned Societies should play a greater role in the scientific advisory process. Government Departments should consider commissioning advice more often from the Academies and Learned Societies.

— Following the recent removal of Grant in Aid support for our policy work, the Royal Society is the only UK Academy that does not receive Government funding for its policy work. This will eventually compromise our ability to provide authoritative, independent advice to Government and others.

Overview

1. The provision of independent advice to Government has always been an important function of the Royal Society. We therefore welcome the Committee's inquiry into the relationship between science, engineering and policymaking in the UK. In our response we address the two different types of input to policy-making from the scientific community. First the scientific community's collective view on issues which affect how science is done (policy for science), and second the expert view on the interpretation of scientific evidence which is needed for effective policy making (science for public policy). This submission has been approved by Lord Rees of Ludlow OM, President of the Royal Society, on behalf of the Council of the Society.

1. *Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science*

2. Irrespective of whether there is a Department for Science, all Government Departments need to deal with science and engineering. It is essential that the Government has access to the very best scientific advice in relevant areas of policy-making. Having a Government department with the word "science" in its title would convey the importance of science to the UK but there is a danger that it would also indicate that science is being "taken care of" and that other Departments need not concern themselves with it. As we outline below, many Departments have made significant progress in putting science at the heart of policy, although there are inconsistencies in some Departments. For example we welcome the fact that the Foreign and Commonwealth Office is now appointing its first Chief Scientist, which in part compensates for the loss of expertise that resulted from its Science and Innovation Network being moved to GO-Science.

3. We welcome the establishment of the Cabinet Sub-Committee on Science and Innovation. This sends an important signal about the importance of science and innovation, although it is too soon to judge its long term impact. We hope that the Sub-Committee will strike a careful balance between science and innovation issues in its agenda. As an independent group of eminent scientists and engineers, the Council of Science and Technology (CST) should also play a key role in putting science and engineering at the heart of policy-making. We have welcomed the role that CST has played in reviewing the Government's progress against the recommendations of the report on nanotechnologies that we produced with the Royal Academy of Engineering. However we question whether the CST's advisory potential is being fully realised.

2. *How Government formulates science and engineering policy (strengths and weaknesses of the current system)*

4. UK Government has made great strides in recent years towards ensuring that the scientific evidence and the maintenance of a strong science and engineering base are at the heart of policy. It is important that this Committee and others keep this situation under review, particularly in light of changes in the wider political and economic environment. We comment first on the situation as regards the use of scientific evidence in public policy, and then move on to the formulation of policy for science where we believe that there is scope for improvement.

5. There has been a substantial improvement in the use of scientific evidence by Government Departments. The appointment of departmental Chief Scientific Advisers at a senior level from outside Government has been instrumental in this. It is vital that the CSAs are involved, from an early stage, in the key strategic decisions within a Department and that they be adequately resourced.

6. Particular challenges are presented by policy issues requiring the input of scientific evidence and expertise that fall at the boundaries between, or cut across, Government Departments. Here cross-cutting groups to ensure that scientific evidence is considered are essential. The Government's CSA has done an excellent job at supporting this and in strengthening the role of the CSAs as a group. As we note in Section 7, the change in remit of the IUSS committee (compared to the former Science and Technology Committee) has meant that there is no longer the same level of Parliamentary scrutiny of these cross cutting issues.

7. We believe that there has also been a favourable cultural shift within the civil service: for example, the introduction of the analysis and use of evidence strand in the competency framework for senior civil servants; and the enthusiastic welcome that was given to our pilot civil servant-scientist pairing scheme in 2007. The Department of Innovation University and Skills (DIUS) is working in partnership with us to roll out this scheme in autumn 2009.

8. Another positive development has been the establishment by most Departments of independent scientific advisory groups. They should have a remit to provide advice on current policy development, identify gaps in the Department's research portfolio and have a horizon scanning function. We welcome the opportunity to identify suitable individuals for membership of these committees. Many Departments have programmes of commissioned scientific research that underpin and evaluate the Department's policies. We welcome the establishment in the Department for Environment Food and Rural Affairs (Defra) of the Science Quality and Priorities Team, which is playing a key role in developing quality assessment within Defra, for example in peer reviewing completed research. We commend this approach to other Departments.

9. We welcome the increase in funding for science in recent years. However we believe that a new structure is needed to provide advice on the allocation of this funding. It is surprising that DIUS is one of the few Departments with science spending not to have an independent advisory group to guide and comment on its policy in this area. We have previously recommended to this Committee (RS, 2007) that the Director General for Science and Research (DGSR) should be advised by an independent group of experts from all disciplines and from a range of institutions: a Science Budget Advisory Group (SBAG). This would be a group trusted by the community and close enough to it to identify emerging areas of science or initiatives that might require funding, as well as identifying the wider consequences of particular funding decisions. This mechanism for advice was proposed in the 1993 White Paper *"Realising our Potential"* (Cabinet Office, 1993), although never implemented. We are aware that the Committee had concerns that this might be too bureaucratic (House of Commons Select Committee for Innovation, Universities, Science and Skills, 2008). However the SBAG would meet infrequently, with a tightly defined agenda, and could thus operate in a light-touch way. Another option would be extend the remit of an existing committee, such as the CST, to provide this independent advice, subject to the range of expertise of its members being appropriate. The DGSR has recently invited us to be one of six organisations providing him with advice during the next Spending Review. We welcome the wider engagement with the community that this initiative will bring but it does not go far enough. Whatever structure is put in place, there should be transparency about the way in which decisions have been made.

10. To ensure that science is at the heart of policymaking, Departments must be in constant contact with the scientific community. The appointment of CSAs, independent departmental advisory groups and the commissioning of scientific research play an important role in this. However, in formulating scientific aspects of public policy and policy for science, we believe that the Government could make better use of organisations such as the national academies and Learned Societies as a source of authoritative and independent advice. We address this in more detail in under Section 6.

3. *Whether the views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is assessed*

11. There are two different types of input to policy-making from the scientific community, each important. These are firstly the scientific community's collective view on issues which affect how science is done (policy for science), and secondly the expert view on the interpretation of scientific evidence which is needed for effective policy making (science for public policy).

12. The collective experience of the scientific community on issues which affect science and the way it is carried out (such as funding structures, the manner in which scientific advice is used by policy makers, intellectual property laws, etc) is powerful because they are the voices from the coal-face—ie the people who are living the effects of policy decisions. Academies and Learned Societies have a key role to play in drawing together the perspectives from their area of science and synthesising them for structured communication. The Royal Society is unique in that it draws on perspectives from right across the scientific, engineering and medical community. In addition, evidence from social science research into the effects of various funding structures or initiatives over time or in different countries can also provide valuable evidence.

13. The evidence generated by scientists and the views of experts about the implications of research for policy-making are vital. The Royal Society's policy reports and statements are good examples of how experts can provide in-depth analysis of a body of evidence—as relevant to a particular policy question—and can formulate specific recommendations for policy-makers charged with delivering solutions, as well as highlighting areas of uncertainty and priorities for further research. Scientific evidence must be treated as central to policy, although it is only one factor that Ministers have to take into account. For example, science might indicate the level of risk associated with a particular course of action or inaction, but politicians have to decide what level of risk to accept. There should be transparency around these decisions.

14. These two forms of input overlap where an in-depth understanding of scientific developments is needed for making decisions about issues such as identifying priority research areas, or choosing between scientific facilities to support, or indeed identifying appropriate subjects and methods for inclusion in school curricula. It is in these cases where it is most important that the decision-making criteria are most clearly set out.

15. The success of any consultation can be assessed as part of the scrutiny outlined under Question 7.

4. *The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating*

16. The Regional Development Agencies (RDAs), advised by their Science and Industry Councils, play an increasingly important role in regional science policy. We welcome this and the fact that the RDAs have agreed to meet regularly with the Technology Strategy Board to facilitate better co-ordination of policy. The RDAs should utilise the economic and social benefits that science and technology can bring to their regions but this does not necessarily require there to be a centre of excellence or large facility in every region. The key to a region's success is less its ability to create or develop its own science and technology base, and more about its capacity to absorb and capitalise on the best science and technology, drawn from a variety of national and international sources. We do not support sections of the science budget being earmarked for particular regions, except where this allocation reflects scientific excellence. We also question what signals any greater focus on policy at the regional level within the UK might send to our international partners, given the increasingly global nature of science and innovation.

17. A range of interpretations and definitions of the Haldane Principle are being used to justify or criticise the involvement of the Government in science funding decisions, particularly those relating to the Research Councils (RC). Recent areas of conflict include the allocation of funding between responsive mode funding and the cross-Council themes that are based on the Treasury's priorities, the increasing focus on translational research and the regional location of large facilities. One person's definition of an overarching strategy (acceptable for Government to outline for the RCs) might be regarded by another as compromising the independence of the scientific community in setting detailed priorities for science. We do not need a debate about what Haldane meant in 1918, but a shared (or at least improved) understanding between the Government and the scientific community about the way in which the Government now interprets the Haldane Principle would be welcome.

5. *Engaging the public and increasing public confidence in science and engineering policy*

18. In the past decade, considerable expertise has developed amongst many stakeholders in ways of strengthening relations between science and society including at the Royal Society.

19. The Royal Society supports the sentiment of DIUS' draft vision for science and society (published last year) and is committed to achieving it. For example, the Society has a significant public programme to *inspire an interest in the joy, wonder and excitement of scientific discovery* (Royal Society, 2008). Involving over 9000 people in 2007, this programme includes lectures, panel discussions, seminars on the history of science and a Summer Science Exhibition. The Society's lectures are also webcast live and made available online as video on demand (history of science seminars are available as a podcasts) to allow the widest number of people to access the public programme. The Society's Press Office works to engage wider publics with science through media coverage of the Society's activities, and by drawing attention to research published in the Society's peer review journals.

20. The Society regards its 350th anniversary in 2010 as a unique opportunity to increase the public's engagement with science and to inspire young people. More specifically, we also view the anniversary as a platform for raising the public profile of science and emphasising its centrality to our shared culture. To this end, our 2010 anniversary programme will include events and activities with over 100 partner organisations drawn from across the arts and sciences, taking place in over 75 museums and galleries across the UK's nations and regions. The centrepiece of the anniversary year will be a major festival of science at the Southbank Centre in which the Society's Summer Science Exhibition, talks and discussions, music, film and the arts will be brought together in a confluence of ideas, issues and debate about science.

21. As well as communicating science, the Royal Society is looking to deepen public engagement. In certain respects, the Government's draft vision for science and society goes only part way to our own. We see two main limitations: the draft treats science as a homogenous activity and underplays its rich diversity; and it leaves little room for more reflective or critical forms of public engagement with science. These points need to be addressed in the development of a final version of the strategy.

22. We see gaining a richer understanding of these complex relations between science and society, and between publics and science, as serving an important function in our goal to *influence policy-making with the best scientific advice*. Historically, decision makers have viewed science issues principally from a scientific perspective, but there is now an acceptance that social and ethical perspectives are also fundamental. Recognising this, the Society has led the scientific community in undertaking effective public and stakeholder dialogue so that policy makers and the science community are able to take account of a diversity of views. Such dialogue exercises have informed the Society's policy work, as well as that of Government.

The Government's Sciencewise Expert Resource Centre for Public Dialogue in Science and Innovation (Sciencewise ERC) is another important step in this direction, and needs Government's full support as well as the resources to expand its work.

23. We are committed to working with Government and others to engage the public in science and engineering policy and in increasing our understanding of the complex relations between science and society.

6. *The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy*

24. We have dealt with the role of many of the bodies listed by the Committee in the previous sections. In this section we focus on the value of the independent authoritative voice of science provided by the National Academies, the Learned Societies and Research Charities.

25. The provision of independent advice to decision makers has been an important function of the Royal Society since the 17th Century. As we prepare for our 350th anniversary in 2010, the Society aims to extend the reach, impact and influence of its policy work through the establishment of a new Science Policy Centre.

26. To support the formulation of science policy in Government, the Royal Society provides:

- authoritative independent advice on topical issues (eg foot and mouth, pandemic influenza) as well as an early warning of emerging issues/evidence that will challenge policymakers (eg Ocean acidification). It does this both in response to specific requests from the Government and proactively, often with the involvement of other UK academies;
- a forum for discussion for policymakers, academics and other stakeholders (including the public) on topical issues—for example the synthetic biology co-ordination group that the Royal Society initiated to track and stimulate policy activities and processes to encourage the responsible and responsive development of this field;
- an interface with the international scientific community (including international scientific organisations such as the InterAcademy Panel);
- links to scientific experts in the UK and overseas to act as formal and informal advisors;
- a focal point for scientific community in initiatives such as the two educational partnerships based at the Royal Society: the Advisory Committee on Mathematics Education and the Science Community Representing Education.

27. The Fellows and many other experts contribute to the delivery of our work and generously provide their time free of charge. However the activities listed above require considerable resources. Until recently, we received a contribution to this work from our Grant in Aid. But the Grant in Aid allocation for our policy work (less than 0.5% of our total Grant in Aid budget) was removed by DIUS in April 2008 and our request to transfer money to our policy work from other parts of the budget for our programmes has been denied. We have had some success in raising money for science policy from alternative sources but, given the current economic climate, available funds are likely to be limited. Eventually our ability to provide authoritative, independent advice to Government and others will be compromised by the limits of our private resources. We ask DIUS to look again at the anomaly where by the Royal Society receives no Grant in Aid funding for its policy work while the British Academy and the Royal Academy of Engineering receive Grant in Aid for this activity and the Academy of Medical Sciences receives a small block grant from the Department of Health that can be used for its policy work.

28. Looking overseas, there are many examples of governments supporting policy work by their academies. The US National Academies, under the auspices of the National Research Council (NRC), is commissioned to provide much of the scientific advice required by the administration. The benefit of the advice being produced by the Academies (rather than from within Government) is that it is independent, authoritative and internationally credible. In contrast to the situation in the US, the UK Academies are only rarely commissioned to provide advice to the UK Government. Currently, much of the work that the Academies might be expected to undertake is carried out by bodies within Government, such as Foresight.

29. There is no question that the work produced by Foresight is of high quality but we believe that the independent advice of the scientific community (facilitated by the Academies and Learned Societies) should pay a greater role in the scientific advisory process. We are not recommending the creation of the type of infrastructure associated with the NRC, but rather that Government Departments should consider commissioning advice more often from the Academies (individually or where appropriate as a group) and on subject-specific issues from the Learned Societies. When such work has been commissioned in the past, for example the 2004 Royal Society/Royal Academy of Engineering study of nanotechnologies, it has proved highly successful. Commenting on the nanotechnologies study, Lord Sainsbury said "*I see this as a model for what we should do in the future when major advances in science and technology look like raising ethical, health, safety or environmental concerns*".

30. We note that there is no mention of universities in the list of bodies determining UK science and engineering policy. Their role should not be underestimated, particularly given the number of universities that are establishing their own science policy centres.

7. *How government science and engineering policy should be scrutinised*

31. Within Government, the CSAs and the rolling reviews of the use of science in Government Departments carried out by GO-Science play an important role in scrutinising the Government's science and engineering policy. The former House of Commons Science and Technology Committee played a vital scrutiny role, not least because it had a cross-departmental remit. We are concerned about the extent to which the current (IUSS) Committee can scrutinise policies that fall at the boundaries of, or cut across, Departments. The House of Lords Science and Technology Committee continues to have a cross departmental remit. The CST has responsibility for looking at issues that cut across Government Departments but it does not have scrutiny as part of its remit. Outside Government and Parliament many organisations have a role in providing independent scrutiny of policy, including ourselves and the wider scientific community. To enable this external scrutiny, Departments must be open and transparent about how decisions are being made and the evidence that they use.

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January 2009

Memorandum 28

Submission from SSC Science Cluster

Summary

- The rationale for the creation of a separate Science Department would need to be clear, with strong evidence of added benefits.
- Government should use the expertise and contacts within Sector Skills Councils (SSCs) when developing science policy. This would boost employer involvement and "ownership" of policy in this key economic area.
- Taking a regional approach to science policy fits with our experience of effective support for science companies.
- Sector Skills Councils involved in science have come together to form a "cluster" which could provide ongoing information and communication on aspects of government policy affecting science companies.

The SSC Science Cluster

1. Semta has established an SSC Science Cluster between those Sector Skills Councils representing companies with a key interest in science. This Cluster had its first meeting in October 2009. The Cluster will provide a mechanism to improve communication and present a coherent message on those issues in science common to such companies. It will also enable the SSCs to share expertise and experience in areas such as Labour Market Information, higher education, schools engagement, and workforce development, to benefit companies across science and science-related industries. The Cluster currently includes Semta, Improve Ltd, Skills for Justice, Skills for Health, Energy & Utility Skills, Lantra, Proskills, Cogent, and ConstructionSkills.

2. This group of SSCs is committed to supporting the vast range of scientific technical and professional skills which are needed to put the UK at the forefront of the global knowledge economy.

Does the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making?

3. Cabinet Sub-Committee papers and meetings are confidential, so it is difficult to establish its specific impact on policy-making.

4. The Council for Science and Technology produces interesting work and publications, but could engage more often with other stakeholders, such as Sector Skills Councils.

Should there be a Department for Science?

5. Before recommending the creation of new department, there are several aspects which should be considered. The Machinery of Government changes in July 2007 undoubtedly caused some fragmentation, and we are concerned that more change might be disruptive. Individuals and organisations find ways to work with the existing circumstances, so changing the current setup would inevitably cause disruption to these relationships.

6. In addition, Lord Drayson (Minister for Science and Technology) already attends Cabinet, so the creation of a new department would not necessarily improve representation in terms of national policy and decision-making, although it might raise the profile of science within Cabinet.

7. It is also important that "science" is understood to play its part in the infrastructure of society, from the economy, to education, energy, health and transport. There is a danger that creating a separate department would remove experts from these other departments and concentrate them into a single entity, which lacked influence in other departments.

8. In summary, the benefits of creating a separate science department are not clear, as the implication is that science would be "extracted" and isolated from the breadth of policy-making. Although the creation of a Department for Science might send an important message about the British government's commitment to science, it would require a strong rationale and clear key deliverables which improve on the current situation.

How does Government formulate science and engineering policy (strengths and weaknesses of the current system)?

9. This government created Sector Skills Councils but does not use them and their resources as much as they could. SSCs provide both information in terms of research, and direct links to groups of employers. In some cases, the government appears not to utilise research which it has tasked SSCs to provide (for example the Sector Skills Agreements) and instead periodically asks the same questions. For example, DIUS' current investigation into STEM skills supply and demand did not utilise the SSAs until a late stage in the process.

10. SSCs can also provide links to and fora for employers who are interested and engaged with skills issues in their sectors. As the "voice" of companies in our sectors on skills, we can provide both information on employer views, and direct access to companies. We can provide insight into the skill needs of science and science-related companies, their frustrations and successes in recruiting and retaining the right people. Through our employer engagement activities, we gather a great deal of information from companies on their requirements and any shortfalls. We can therefore advise policy-makers on potential impacts in our sectors. We already contribute through consultations responses, ministerial briefings, joint working with departments, etc, but this process could be improved through earlier communication, and more effective feedback.

11. In formulating wider national policy, government often seems to prefer a "one-size-fits-all" approach, which can leave science companies questioning its relevance. For example, the funding for skills available through Train to Gain, prior to the new Sector Compacts, limited the continuity of economically viable skills across further education to higher education. The current system has led to a dislocation in policy and provision of employer-facing science provision between FE and HE, particularly when compared to the provision available to other sectors. The skills funding policy prior to the recently announced flexibilities also took little account of the need for science skills at higher (technical and professional) levels.

Are the views of the science and engineering community central to the formulation of government policy?

12. We would summarise the attitude of government to the needs of the science sector as "receptive" but sometimes lacking in specific action to address concerns.

13. In the devolved administrations, the experience is reflected in the comments made previously. In Scotland, our experience has been that the Scottish government is supportive of science, but could use the SSC network more effectively in its decision-making and policy formation. However, the Scottish government has made additional commitment to science sectors in areas such as life science apprenticeships, which suggest it has a strong understanding of the particular needs of the sector, and is responsive to these needs.

Should the views of the science and engineering community be central to the formulation of government policy?

14. As representative organisations for employers, the SSCs in the Science Cluster are convinced of the value of employer engagement in the formulation of government policy. The importance of skills in science to the fabric and infrastructure of a modern advanced economy cannot be overstated. The progression of new science research and development into economically valuable skills and high value-added products will provide UK plc with a proper place in the global knowledge economy. The supply of and demand for science skills enables UK plc to grow its small firms, retain its multinational capacity, and attract new investment from abroad.

15. "Science" is core to many sectors such as energy and transport, as well as the more obviously science-based industries. These "science-related" industries rely on a good supply of people and skills with a scientific basis, and have much to contribute to science policy, particularly relating to education and public perception.

16. If the government truly believes that science principles and skills are essential to the future success of UK plc, consideration must be made of the needs of the community. It would be helpful if legislation and proposals could be assessed at an earlier stage for their impact on science, so that there are no unintended consequences. We do not expect all policy to be formulated with science in mind, simply that those making decisions are more aware of the potential impact on the sector.

17. The SSCs which are involved in science have created a "cluster" which could provide ongoing information and communication on aspects of government policy which have an impact on skills in science companies. This SSC Science Cluster has already met, and we will be working together to ensure all the SSCs involved in science present a coherent message.

How is the success of any consultation assessed?

18. Where formal submissions are made, SSCs naturally monitor the effectiveness of these. We are in contact with government departments and officials regularly on particular issues relating to our sectors.

The case for a regional science policy (versus national science policy)

19. There is no doubt that science "clusters" are a key element of the sector's operation. The Sector Skills Agreement for the Bioscience industry highlighted the development of networks and clusters (which are often arranged on geographical lines).

20. Regions are also in a strong position, through Regional Development Agencies in England and regional skills partnerships, to respond to the particular needs of science companies in their locality. Working with local universities and colleges is also a key element of successful implementation of science policy, emphasising the local links with companies in terms of both supply of skills and research collaboration.

21. There is also value in allowing regions to have input into the development of the supply of people with science skills, as they will have an overview of areas such as science education, and regional science initiatives (such as Science Cities).

Does the Haldane principle need updating?

22. We support the Haldane principle, but recognise that business can be excluded from many research decisions. The proposed reform of the Research Assessment Exercise which brings funding for university research closer to the needs of business is welcome.

23. We endorse the continuing independence of the Research Councils from political influence.

Engaging the public and increasing public confidence in science and engineering policy

24. There is no doubt that the relationship between the government and the science community was strained by various recent scientific debates, such as foot and mouth, BSE, GM crops, etc. The public and the media may not always appreciate the difficulties of formulating policy in a scientific environment, where so much can be at stake (both in terms of public health and the economy) but where solutions cannot be quickly established. It is important to raise public awareness of the difficulty of providing absolute cause, effect and solution for a given problem. Government and science must work closely together to ensure what is known and can be proved is used as the basis for policy, and what is unknown and unproven receives proper funding and attention.

The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy

25. Sector Skills Councils, with their remit to provide expert analysis of the needs of companies in their sectors, are already providing evidence of skill demands across all the science industries. The new SSC Science Cluster will be drawing together the ongoing work to ensure that coherent science priorities emerging from the Sector Skills Agreements are established, and that appropriate actions to address these priorities are put in place.

26. We have already commented on the potential positive influence of RDAs in England.

How should government science and engineering policy be scrutinised?

27. The recently renamed Innovation, Universities, Science and Skills Committee itself is clearly an integral part of the scrutiny of policy in science. It has already examined key areas such as science budget allocations. It should continue to hold government and government bodies to account for their actions which affect the science sector.

28. The SSC Science Cluster will be considering all aspects of government policy which impact on science in companies.

January 2009

Memorandum 29

Submission from Semta

SUMMARY

— Semta does not believe that the rationale for separate Science Department is strong—should such a department be created, it must add clear benefits to existing arrangements.

— The government could use Sector Skills Councils' expertise and networks more effectively and more often in the policy-making process. The government should use the newly-formed groupings of Sector Skills Councils in manufacturing and science in the development of policy.

SEMTA, THE SECTOR SKILLS COUNCIL

1. Industry owned and led, Semta aims to increase the impact of skilled people throughout the science, engineering and manufacturing technologies sectors. We work with employers to determine their current and future skills needs and to provide short and long term skills solutions, whether that be training and skills development, or campaigning with government and other organisations to change things for the better. Through our labour market intelligence and insights from employers across our sectors, we identify change needed in education and skills policy and practice, and engage with key industry partners and partners in the education and training sector, to help increase productivity at all levels in the workforce.

2. The sectors we represent are: Aerospace, Automotive, Bioscience, Electrical, Electronics, Maintenance, Marine, Mathematics, Mechanical, Metals, and Engineered Metal Products.

3. Semta is part of the UK-wide network of 25 employer-led Sector Skills Councils (SSCs).

Does the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making?

4. Cabinet Sub-Committee papers and meetings are confidential, so it is difficult to establish its specific impact on policy-making.

5. The Council for Science and Technology produces interesting work and publications, but could engage more often with other stakeholders, such as Sector Skills Councils.

Should there be a Department for Science?

6. There are strong arguments both for and against such a step. A separate department could bring together expertise and impetus to influence policy-making for science. It might also send an important message about the British government's commitment to science, and about the role which science will play in helping the UK face the inevitable difficulties of the future (both economic and social).

7. However, the Machinery of Government changes in July 2007 undoubtedly caused some fragmentation, and we are concerned that more change might be disruptive. Individuals and organisations find ways to work with the existing circumstances, so changing the current setup would inevitably cause disruption to these relationships. In addition, Lord Drayson (Minister for Science and Technology) already attends Cabinet, so the creation of a new department would not necessarily improve representation in terms of national policy and decision-making, although it might raise the profile of science within Cabinet. It is also important that "science" is understood to play its part in a whole range of activities, from the economy to education to health. There is a danger that creating a separate department would remove experts from these other departments and concentrate them into a single entity, which lack influence in other departments.

8. It is therefore difficult to see the added benefit of a separate department for science. If such a department was created, we would like to see a strong rationale, with key deliverables and relationships articulated.

How does Government formulate science and engineering policy (strengths and weaknesses of the current system)?

9. This government created Sector Skills Councils (SSCs) but does not use them and their resources as much as they could. SSCs provide both information in terms of research, and direct links to groups of employers. In some cases, the government appears not to utilise research which it has tasked SSCs to provide (for example the Sector Skills Agreements) and instead periodically asks the same questions. DIUS' current investigation into STEM skills supply and demand did not utilise the SSAs until a late stage in the process.

10. SSCs can also provide links to and fora for employers who are interested and engaged with skills issues in their sectors.

11. Government could do more to engage with Sector Skills Councils, simply by including them earlier in the policy-making process, and by using their links to employers in the development of policy.

12. In formulating wider policy, government often seems to prefer a "one-size-fits-all" approach, which can leave science and engineering companies questioning its relevance. For example, the funding for skills available through Train to Gain has hitherto been underused, as the science and engineering sectors' skill needs are at higher levels. The new sector Compacts are beginning to address this, but valuable time has been lost in engaging with science and engineering employers.

13. The new Manufacturing Strategy is an interesting development, which sums up the positive aspects and potential pitfalls of science and engineering policy. A manufacturing strategy is a tremendous boost to all the industries involved in manufacturing. We hope that it will raise the profile of manufacturing within government, and give credibility to measures designed to sustain the UK's manufacturing base. However, there are elements which will need careful management to ensure they are not lost in the departmental policy cross-over of BERR, DIUS and DCSF (particularly those elements relating to education).

14. Having at least three departments (BERR, DIUS, DCSF) involved in the development of science and engineering policy (in addition to other departments such as Health and Work & Pensions, with another in the Science Department proposed above) inevitably raises issues. Semta's view is that this fragmentation is not necessarily a problem, where officials work together.

Are the views of the science and engineering community central to the formulation of government policy?

15. We would summarise the attitude of government to the needs of the engineering and science sectors as "receptive" but sometimes lacking in specific action to address concerns. For example, the automotive industry recently approached government with specific concerns around the economic situation, and while their needs were heard sympathetically, there is as yet no sector-based response—the response so far has merely reiterated government support which is available to all sectors.

16. The sector-based approach on skills recommended by Leitch has been slow in implementation. It is only now being seen by companies in the Compacts, negotiated by SSCs to meet the particular needs of their sectors. It is encouraging that so many of the Compacts are for sectors involved in science and engineering, and that the very first one agreed was with Semta. The flexibilities negotiated by Semta (eg funding for second qualifications at a particular level) have since been made available to all sectors, which will help achieve the Leitch targets across the economy, but reduces the impact of a sectoral "offer".

17. In the devolved administrations, the experience is similar, with a few additional comments. In Wales, the newly-formed Manufacturing Forum is likely to be very helpful in raising the profile of manufacturing (and engineering), as well as improving understanding. Government in Scotland is supportive of science and engineering, but could use the SSC network more effectively in its decision-making and policy formation. However, the Scottish government has made additional commitment to the engineering sector in areas such as life science and adult apprenticeships, which suggest it has a strong understanding of the particular needs of the sector.

Should the views of the science and engineering community be central to the formulation of government policy?

18. As the SSC for science, engineering, and manufacturing technologies, Semta is convinced of the value of employer engagement in the formulation of government policy. Science and engineering skills are utilised in occupations across the economy. The importance of these engineering and science skills to the UK economy as a whole means that the views of those working in these sectors and subjects must be considered.

19. In addition, the contribution of the science and engineering sector companies to the economy is significant. For example, engineering companies are continuing to invest in the apprenticeship programme which helps individuals become highly skilled technicians and managers, who are able to contribute to those areas of manufacturing where the UK is leading the world.

20. If the government accepts that science and engineering is essential to the future success of UKplc, consideration must be made of the needs of the community. It would be helpful if legislation and proposals could be assessed at an earlier stage for their impact on science and engineering, so that there are no unintended consequences.

21. The Sector Skills Councils which cover science and engineering have already formed themselves into clusters—the SSC Science Cluster and the Manufacturing Skills Alliance. We hope this will make it easier for government to engage directly with all the SSCs in a particular area, and for us to speak with a single voice where appropriate on policy.

How is the success of any consultation assessed?

22. Where formal submissions are made, SSCs naturally monitor the effectiveness of these. We are in contact with government departments and officials regularly on particular issues relating to our sector.

23. Unfortunately, we are sometimes faced with a disparity between ministerial opinion, which is usually very positive and supportive, and the practical implementation of policy. For example, Semta remains concerned that the apprenticeship reforms are being introduced to support and encourage non-traditional apprenticeship sectors. The proposals suggest a single approach across the economy to address the needs of non-traditional sectors, which does not meet the needs of engineering. Despite ministerial assurances that the measures will not interfere with existing arrangements where they are working well, there are still concerns. As the sector with one of the largest and most successful apprenticeship frameworks, the views of our employers must have a significant influence on the development of apprenticeships as a whole.

The case for a regional science policy (versus national science policy)

24. Semta has contributed to the SSC Science Cluster submission on this issue.

Does the Haldane principle need updating?

25. Semta has contributed to the SSC Science Cluster submission on this issue.

Engaging the public and increasing public confidence in science and engineering policy

26. Semta has contributed to the SSC Science Cluster submission on this issue.

The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy

27. Sector Skills Councils, with their remit to provide expert analysis of the needs of companies in their sector, are already providing evidence of skill demands across all the science and engineering industries. The new SSC Science Cluster will be drawing together the ongoing work to ensure that coherent science priorities emerging from the Sector Skills Agreements are established, and that appropriate actions to address these priorities are put in place. The Manufacturing Skills Alliance has already come together to work on key projects, and will continue to investigate joint working where appropriate.

How should government science and engineering policy be scrutinised?

28. The Innovation, Universities, Science and Skills Committee itself is clearly an integral part of the scrutiny of policy in science and engineering. It has already examined key areas such as science budget allocations and the future of the engineering industry. It should continue to hold government and government bodies to account for their actions which affect these sectors.

29. The SSC Science Cluster and the Manufacturing Skills Alliance will be considering all aspects of government policy which impact on our companies.

30. As an individual SSC, Semta will continue to respond robustly to consultations and inquiries, drawing on the views of our companies and our in-house technical expertise. It is our role to communicate government policy to employers, to represent their views in a coherent manner to government, and provide channels of communication between government and business.

January 2009

Memorandum 30

Submission from Research Councils UK (RCUK)

Introduction

Summary

- Effective policy-making must be based on research evidence from across the entire spectrum, including in arts and humanities research; all policies should be evidence-based and policy-makers should use advice and evidence from a wide range of sources.
- The attendance of the Science Minister at Cabinet meetings is a welcome development.
- Given recent changes in departmental structure, RCUK does not consider the creation of a Department for Science to be a priority at this time. It could lead to the perception that science in Government is being covered there, a consequence of which could be to remove its due consideration in other departments.
- Improved coordination of departmental science funds is needed, with more effective mechanisms in place for cross-departmental coordination of policies, which draw on the research base as a whole.
- The Council for Science and Technology (CST) is a potentially valuable source of advice. The Government should ensure that it acts on this advice and consider further how best to maximise the CST's value and impact.
- The Government's efforts to consult more widely in policy formulation is welcome; however, the Government should consult on a broader range of research issues and research policy development should be longer term, recognising the fact that research is carried out over a long timeframe.
- There should be greater transparency in Government research policy formulation. Feedback should be provided on how the evidence submitted in response to consultations has been used, or where it has not been used. This would encourage the research community to provide input to consultations and help ensure that policies are based on the best possible evidence. A further incentive would be to reward research that has been used in policy development through the Research Excellence Framework.
- The appointment of Chief Scientific Advisors (CSAs) in Government departments is highly beneficial for ensuring that evidence from research is used in formulating policies. Consideration should be given to extending these appointments to include CSAs in all relevant government departments potentially on a full-time basis.
- RCUK fully supports the Haldane principle, in particular its fundamental role in underpinning the independence of the Research Councils.
- Decisions regarding the location of large facilities may involve the need to balance solely research-led considerations with other factors.
- DIUS should be placing a greater focus on strategic coordination of public dialogue and encouraging mature debate with society.
- All relevant Parliamentary Select Committees should have a role in scrutinising how the evidence from research is used in Government policy formulation. Embedding scrutiny more widely in Government would more effectively embed the use of research in policy-making.

1. Research Councils UK is a strategic partnership set up to champion the research supported by the seven UK Research Councils. RCUK was established in 2002 to enable the Councils to work together more effectively to enhance the overall impact and effectiveness of their research, training and innovation activities, contributing to the delivery of the Government's objectives for science and innovation. Further details are available at www.rcuk.ac.uk

2. This evidence is submitted by RCUK on behalf of all Research Councils and represents their independent views. It does not include or necessarily reflect the views of the Science and Innovation Group in the Department for Innovation, Universities and Skills. The submission is made on behalf of the following Councils:

Arts and Humanities Research Council (AHRC) (separate response also submitted)

Biotechnology and Biological Sciences Research Council (BBSRC)

Engineering and Physical Sciences Research Council (EPSRC)

Economic and Social Research Council (ESRC)

Medical Research Council (MRC)

Natural Environment Research Council (NERC)

Science and Technology Facilities Council (STFC) (separate response also submitted)

3. All Research Councils have contributed to the main text of this response.

Definitions

4. Government has been defined to include the devolved administrations.

5. Science and engineering has been interpreted to include all aspects of research, including knowledge based on scholarship and research undertaken in the physical, biological, engineering, medical, natural and social disciplines, and the arts and humanities.

6. RCUK considers that the whole research spectrum, including the arts and humanities, is relevant to evidence-based policy-making. In a complex world, traditional science disciplines can only offer part of the picture; policy makers need to ensure that they draw on expertise from all areas of research. Evidence from research as a whole should be used to inform Government at all levels and drive forward decision and policy-making.

7. RCUK recommends that this inquiry is expanded to include the views of the arts and humanities research community, given the number of responses made to consultations and inquiries by the AHRC and their community of researchers. Further details can be found in the AHRC's response to this inquiry, which has been submitted separately.

8. It is important to distinguish between i) using research to influence a broad range of policies, and ii) influencing "science and engineering" policy, and the role of various bodies in both. There is overlap, but the two are not the same.

Response to Specific Points

Q1. Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science

9. We welcome the attendance of the Science Minister at Cabinet meetings. This is a positive step towards ensuring that science and engineering is embedded at the heart of policy-making, and should now be built upon. As highlighted in paragraph 6, we consider that there is value across the whole research spectrum and research could usefully be incorporated into the Minister's title.

10. The current departmental arrangement sensibly brings together innovation, higher education and research. This enables Research Councils to work closely with HEFCE, for example on the Research Excellence Framework, as well as with other NDPBs such as the TSB, NESTA, and the Design Council. As higher education is a devolved matter, Research Councils also maintain similar close working relationships with HEFCW, SFC and DEL NI, as well as other relevant departments in the devolved administrations.

11. The inclusion of "Science" in the title of DIUS, mirroring the Select Committee, would be welcomed. Given recent changes in departmental structure, RCUK does not consider the creation of a Department for Science to be a priority at this time. While the creation of a Department for Science would bring visibility and prominence it could also lead to the perception that science in Government is being covered there, a consequence of which could be to remove its due consideration in other departments. It is important that debates such as this do not distract attention from the need to make the relatively new departmental structure and other existing structures as effective as possible in ensuring that science and research feed into evidence-based policy making. 12. The coordination of departmental science funds should be improved. There are deficiencies in the deployment of these funds by some departments, and an ongoing failure to apply Research Council Institute and Public Sector Research Establishment Sustainability Study (RIPSS) principles.

13. RCUK acknowledges the Council for Science and Technology's recommendation from its recent report "*How Academia and Government Can Work Together*" that government departments, Universities, Research Councils and Learned Societies should work collectively to identify and create a set of exchange

mechanisms, including internship and secondment schemes, and promulgate them widely. Research Councils are already active in this area and examples of some of our people exchange mechanisms are provided in paragraph 34.

14. The Council for Science and Technology (CST) is a potentially valuable source of advice. The Government should ensure that it acts on this advice and consider further how best to maximise the CST's value and impact in policy development.

Q2. *How Government formulates science and engineering policy (strengths and weaknesses of the current system)*

15. The Research Councils' independence of Government is a vital strength of the current system. The advice Research Councils are required by charter to provide is thus also properly independent. Independence from Government is essential to maintain public confidence in the advice provided.

16. Research Councils operate a number of fellowship schemes, internships, placements and workshops which aim to promote knowledge exchange between academic and government departments, and ensure policies are developed on the basis of evidence from research. Examples of these are provided in paragraph 34.

17. RCUK believes that all policies should be evidence-based. As highlighted in paragraph 8, it is important to distinguish the use of research in broad policy-making and the formulation of research policy.

Use of Research in Policy-Making

18. Policy-makers should seek and use advice and evidence from a wide range of sources, including relevant stakeholders and the general public. Research Councils have access to experts across all research areas, and can provide a useful resource for Government in identifying whom to consult on policy issues.

19. RCUK welcomes the Government's efforts to consult more widely in policy formulation; however information should be provided on what happens to the inputs from consultations, identifying where and how responses have had an impact in shaping the policy. Consultations should be conducted at the outset to ensure they influence policy formulation at the very early stages.

20. The appointment of Chief Scientific Advisors (CSAs) in government departments is highly beneficial for helping to ensure that evidence from research is used in formulating policies. Consideration should be given to extending these appointments to include CSAs in all relevant government departments potentially on a full-time basis.

21. CSAs could be better integrated into departments by giving them an appropriate level of authority and budget to translate discussions on evidence-based policy-making into actions. Chief Economists, Chief Social Researchers and Chief Statisticians should also have their roles strengthened in a similar way.

22. The method for appointing CSAs in the UK through open competition and on the basis of their expertise is a real strength and must continue.

23. New mechanisms are needed for effective cross-departmental coordination of policies, which draw on the wider research base. There is also a need to ensure that long term sustained environmental observations (necessary to track and inform policy) can be supported.

Development of Research Policy

24. Research policy development should be longer term and carefully considered, because research is usually carried out over a long timeframe. This is particularly the case for areas that involve significant investment over prolonged periods, for example, scientific facilities or international collaborations. The Science and Technology Facilities Council (STFC) is making a separate submission to this inquiry describing these considerations in greater detail. The work of all departments should be within the context of the Government's 10 Year Science and Innovation Investment Framework.

25. As argued in relation to the use of research in all policy making, there should be greater transparency in government research policy formulation and RCUK should be consulted as a matter of routine on these important issues.

26. Likewise, when Government consults with stakeholders, as much contextual information as possible should be provided at the earliest opportunity to ensure there is time for considered input, and Government should make clear how the responses to their consultations have been used to inform research policy development.

27. Government consultation with Research Councils worked effectively in the development of the policy on full economic costing. Research Councils were fully involved at an early stage and helped to ensure that the policy reflected the views and interests of all relevant parties. We welcome that the Research Councils were also consulted on the GO Science "*Code of Practice for Scientific Advisory Committees"* which we believe to be well-considered and appropriate.

28. However, the recently published Annual Innovation Report is an example of where it would have been beneficial for Government to involve the Research Councils more closely in discussions.

Research Council Links with Government Departments

29. Most Research Councils have direct links with government departments and provide input into policy development through a variety of mechanisms, including concordats, representation on advisory bodies, and collaborative funding, as well as secondments to government departments as highlighted in paragraph 34. Specific examples include:

- The Core Issues Group, which includes the CSAs of government departments and the Chief Executives of the Research Councils and had its first meeting in July 2008.
- AHRC has links with numerous government departments via projects funded as part of responsive mode funding, strategic programmes and research centres. For example, the Director of the AHRC's Diasporas, Migration and Identities Programme was commissioned by the Home Office to produce a review of arts and humanities research literature relating to "*The Roots, Practices and Consequences of Terrorism"*. The Design Against Crime Research Centre, with some its projects funded by the AHRC, has provided advice on crime reduction to the Prime Minister's Strategy Unit. The AHRC also has a Concordat with the Home Office, and several more are being developed with other departments.
- BBSRC has working links with all relevant government departments, particularly Defra and, increasingly, DfID. Representatives from the BBSRC senior executive and research community sit on policy advisory bodies, for example the Advisory Committee on Releases to the Environment (ACRE), NPL Advisory Committee and the TSEs funding forum. In addition, Defra commissions a significant amount of policy-focused research from the BBSRC sponsored institutes.
- EPSRC has links with several government departments, including working extensively with DfT on joint calls and having a co-funding scheme with MoD (along with other Research Councils). As a specific example, EPSRC has the tools to work with DfT to tailor knowledge to specific policy challenges in sustainable transport. The CSA for DfT and BERR, Brian Collins, is on the EPSRC User Panel and the MoD CSA, Mark Welland, is on EPSRC Council. Both MoD and DfT are listed as EPSRC strategic partners.
- ESRC has concordats with a number of government departments, in which research priorities and strategies are regularly discussed, as well as policy requirements for evidence and other items of mutual interest. Advice is also provided to government departments outside of the usual concordat arrangements. ESRC co-funds a number of research initiatives with government departments; for example, the ESRC and DfID have a joint research funding scheme focused on poverty reduction in developing countries. ESRC also co-funded research on Scottish demography with The Scottish Government. An example of ESRC research investments influencing policy is through the work of the Centre for Economic Performance (established by the ESRC in 1990), which has influenced policies including the Working Families Tax Credit Scheme and the National Minimum Wage. ESRC has also held public policy seminars.
- MRC has links with a number of government departments, the most formal ones being with DH/ OSCHR and DfID, but also with the devolved administrations. On OSCHR, the strategies of MRC and NIHR are being aligned and there is agreement on which body takes the lead in a number of areas.[131] With DfID there are continuing discussions concerning identification of priorities; DfID provides funding to MRC of about £9 million per annum.
- NERC and Defra have a close relationship through regular meetings of the Chief Executive of NERC and the Defra CSA, as well as working level collaborations between Defra and the NERC community; for example many NERC staff have commented on Defra and EA science strategies, have direct working relations with Defra and EA project officers and sit on Defra/EA Theme Advisory Groups. NERC initiated the science-policy partnership programme, *Living With Environmental Change*, which has 18 partners including six research councils, 11 departments of state, government and agencies and one trading fund (the Met Office). NERC also collaborates with other relevant government departments both on a bilateral basis and through forums, for example the Environmental Research Funders Forum (ERFF), the cross-Departmental Marine Science Coordinating Committee (MSCC), and the UK Collaborative on Development Sciences (UKCDS). NERC also co-funds a number of research programmes with government department

[131] www.nihr.ac.uk/files/pdfs/OSCHR_Progress_Report_18.11.08.pdf

partners, for example, the Ecosystems Services and Poverty Alleviation programme with DfID (and ESRC) and the Sustainable Marine Bioresources programme with Defra and the Scottish and Northern Ireland governments.

— STFC and NERC have links with government departments through the British National Space Centre partnership.

— STFC has numerous links with UK Government departments as well as working with the Scottish Government and the Welsh Assembly Government. Within the UK it has close relationships with both the Northwest Regional Development Agency and the South East England Development Agency, within whose regions the STFC Science and Innovation Campuses are based. STFC also works extensively with the international scientific community with regard to investments both in the UK and abroad, and this includes working with European Union bodies and institutions as well as with Governments around the world; this is achieved in collaboration with the appropriate UK Government representation and support.

Q3. *Whether the views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is assessed*

30. The professional views of the research community are essential to effective policy formulation. Government consultations should be better coordinated, with greater clarity on who is being consulted (individuals, organisations or sectors) and on the information the Government needs. The systems should ensure that it is straight forward for organisations, as well as individuals, to respond.

31. Feedback should be provided on how the evidence submitted in response to consultations has been used, or where it has not been used. This would help encourage the research community in particular to provide input to consultations and ensure that policies are based on the most relevant and up-to-date evidence. A further incentive would be to reward research used in policy development through the Funding Councils' Research Excellence Framework (REF). RCUK is working closely with HEFCE on revised proposals for the REF to ensure that measures of impact relating to economic benefit, contribution to public policy, development of practice in the public and private sectors, and public engagement are included in the new assessment system.[132]

32. Formal evaluations provide a useful method for assessing the success of consultations. The planned evaluation of the passage of the Human Fertilisation and Embryology (HFE) Bill through pre-legislative stages and Parliament could provide a good model; this will include an analysis of the effect of evidence submitted by the MRC, the Academy of Medical Sciences, the Royal Society, the Wellcome Trust and the Association of Medical Research Charities.

33. An international perspective may be useful in considering alternative mechanisms and strategies for helping ensure research community input into policy formulation:

— The US Government obtains advice from a wide range of sources with its think tanks playing a much greater role than in the UK. Approximately 100 12-month fellowships are awarded each year, which place researchers into public policy roles within the federal government; these are very successful and highly regarded.

— The Swedish Government consults widely on research bills to Parliament, and the science and engineering community are fully engaged. In Autumn 2008 the Swedish Government presented a Research Bill for the period 2009–2012. The Research Councils, Vinnova (the Swedish Innovation Agency), HEIs and several authorities were tasked by the Government with submitting research, knowledge and innovation strategies. A total of around one hundred authorities and organisations submitted their strategies, which formed the basis of the Government's assessments of the initiatives presented in the Bill.

— The German Science Council is Germany's independent science policy advisory body, and is directly comparable to the CST. It is generally considered that the German Science Council has a greater influence in policy development than the CST.

— France makes greater use of secondments from the research community to Government, for example to the Ministries of Higher Education, Research, Industry and Health, or into the President's Cabinet (as highly influential special advisers).

— The Spanish Government ensures full participation of all stakeholders in the development of their National Plan for R&D. They also intend to develop a New Law of Science, and have consulted with the research community through a number of "Discussion Sessions in S&T".

[132] The RCUK response to the HEFCE consultation on the REF can be found on our website: www.rcuk.ac.uk/cmsweb/downloads/rcuk/consultations/ref.pdf

Research Council People Exchange Schemes

34. Research Councils operate a number of fellowship schemes, internships, placements and workshops which aim to promote knowledge exchange between academic and government departments, and help ensure policies are developed on the basis of evidence from research. Examples include:

- Secondments from the Research Councils to DIUS: most recently Dr Mike Davies has been seconded from the MRC, Dr Neil Viner has been seconded from EPSRC, and Dr Caroline Fenwick has been seconded from NERC.
- BBSRC and NERC operate 3-month policy secondments for PhD students to prepare briefing material and reports at the Parliamentary Office of Science & Technology (POST).[133,134] The NERC scheme also includes secondments to the Scottish Parliament Information Centre, the Members' Research Service, Wales, and the Royal Commission on Environmental Pollution.
- The ESRC placement fellowship scheme[135] and the NERC policy placement Scheme,[136] allow researchers to spend time in a partner organisation (eg Government department, devolved administration) to undertake policy-relevant research and upgrade the research skills of partner organisation employees. Placements have been offered with a large number of government departments, including the DCMS and the FCO. One ESRC placement fellow helped Defra develop its approach to evidence-based policy-making, focusing on the process of formal written consultation. Both ESRC and NERC have also started offering "reverse" placement fellowships where government researchers spend time undertaking a project in an HEI, or within the NERC scheme, at NERC head office or a NERC funded centre.
- The ESRC Knowledge Transfer Learning and Development workshops[137] aim to increase understanding of how research can be applied to inform policy and practice. A jointly funded ESRC/NERC workshop, entitled "Engaging with the Public Sector", for PhD students with a research interest in Climate Change, was held on the 1st-2nd December 2008 at Herriot Watt Conference Centre, Edinburgh. NERC is planning further workshops based on this model with other partners, for example the British Ecological Society.

Q4. *The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating*

35. RCUK fully supports the Haldane principle, in particular its fundamental role in underpinning the independence of the Research Councils. In a policy development context, it enables Research Councils to provide and to be seen to provide independent advice to Government to support policy-making, which builds and maintains public confidence in this process. There is an appropriate level of tension in the present arrangements and this must be protected.

36. RCUK endorses the Government's responsibility for setting the over-arching strategy and framework for the research base. Within this framework, however, Research Councils develop their own strategies and priorities and make individual funding decisions based on thorough and detailed peer review. The central criterion for funding research is excellence, defined in its widest sense.

37. Research funding is not a devolved matter. Research Councils have a UK-wide remit and fund institutions that demonstrate excellence through peer review regardless of their location. Nevertheless we work closely with the devolved administrations to ensure a mutual understanding of strategies.

38. We expect that where there is a clear research advantage to be derived from siting a large facility at a particular location that this would have a strong weight in any site decision. Where the research advantages are less clear, all relevant factors should be considered, including the presence of complementary facilities; previous investment in a particular location; local or on-site expertise; the local scientific community; local businesses; access to transport and communications; strategic regional development opportunities; and appropriate fit within wider political considerations.

Q5. *Engaging the public and increasing public confidence in science and engineering policy*

39. RCUK commends the establishment by DIUS of the Sciencewise Expert Resource Centre, which helps policy-makers commission and use public dialogue to inform policy decisions. Early stage dialogue with the public is essential in ensuring that the impact of research is maximised and that public confidence in policy-making is sustained.

[133] www.bbsrc.ac.uk/business/people_information/parliamentary_fellowships.html
[134] www.nerc.ac.uk/using/schemes/secondments.asp
[135] www.esrcsocietytoday.ac.uk/ESRCInfoCentre/KnowledgeExch/Government.aspx
[136] www.nerc.ac.uk/using/publicsector/placements.asp
[137] www.esrcsocietytoday.ac.uk/ESRCInfoCentre/KnowledgeExch/KTlandDWorkshops.aspx

40. Research Councils have played an active role in ensuring that public views have influenced and shaped our own research policies. Three recent examples involve using public dialogue to identify concerns and aspirations around emerging research opportunities:

Nanotechnology for Healthcare

The findings from the public dialogue in nanotechnology were used alongside advice from the research and user community in the development of the scope of the nanotechnology for healthcare grand challenge call. Critical to its success was the use of independent facilitators to conduct the dialogue, and the involvement of academic researchers and EPSRC staff throughout the process.

Ageing

Results from the BBSRC/MRC public consultation on ageing research has helped shape the cross-Council initiative on Lifelong Health and Wellbeing, for example by ensuring that the initiative encompassed prevention research throughout life, an area identified as a priority by the public.

Stem Cells

The stem cell consultation initiated by the Research Councils and funded by Sciencewise, was the largest ever public and stakeholder (including science, medicine, industry, ethics and religion) dialogue on stem cells in the UK, and the findings were published in December 2008. They showed conditional support for all avenues of stem cell research, and identified issues around, for example, investment and coordination between public and private sectors, clinical trials, and communication of uncertainties.

41. Public dialogue is a useful generic tool in developing the strategy and direction for specific research areas, under the right circumstances. It is one of the many advice streams that need to be considered when developing research strategy and priorities.

42. DIUS should be placing a greater focus on strategic coordination of public dialogue and on encouraging mature debate with society. At present, the priority appears to be exciting the public with science. Whilst in itself this can be worthwhile, according to the RCUK/DIUS public attitudes to science survey 2008, there is already a very positive attitude towards science, with 82% "amazed by science"—up from 75% in 2000. It may therefore be more useful to focus on raising public awareness of the contribution of scientific research across the board, and engendering a sense of public ownership of research endeavours.

43. DIUS recently consulted on *"A Vision for Science and Society: a consultation on developing a new strategy for the UK"*. RCUK welcomed the strategy which set out a commitment to leadership and a national approach coordinated by DIUS, which placed dialogue with the public at its centre, as well as recognising and addressing the complex relationships between science and industry.

44. We also sought clarity on DIUS's views of its own role, capabilities and expectations in relation to Science and Society, and on how DIUS planned to lead the community and other government departments, and provide incentives for partners to work together more effectively.

45. RCUK considers that the Government should make every effort to ensure that the channels of communication over which it has control deliver accurate information. All stakeholders have a part to play in influencing other channels of communication to do the same.

Q6. *The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy*

46. Research Councils play a key role in leading and influencing the debate on UK research policy. UK research policy is not "owned" by any one stakeholder; all stakeholders contribute to its development and this is a real strength.

47. All policies should be evidence-based and a broad range of stakeholders should be consulted in their formulation, for example the Learned Societies. There have been several reports from Learned Societies which have been useful in informing research policy development; Learned Societies should continue to produce these and Government should continue to use them. The Royal Society and Royal Academy of Engineering report *"Nanoscience and nanotechnologies: opportunities and uncertainties"*, which was published in 2004, is a good example of the contribution that Learned Societies can make.

48. Public sector procurement has an important role to play in shaping research priorities as it stimulates innovation and research, and can be an efficient driver to ensure the future provision of essential products and services.

Q7. *How government science and engineering policy should be scrutinised*

49. The IUSS Select Committee already has an important role in scrutinising the use of research in the development of research and other policies, and RCUK believes that a similar approach should be adopted by all relevant Parliamentary Select Committees in scrutinising how the evidence from research is used in Government policy formulation. Embedding such scrutiny more widely in Government would more effectively embed the use of research in policy-making.

50. RCUK welcomes the refreshing of the Science Reviews conducted by GO Science and believe that these should continue.

51. We also welcome independent reviews in all policy areas, noting that these tend to be in response to developments. A longer term view of research policy development would allow for these to be built into strategies from the outset.

January 2009

Memorandum 31

Submission from Dr Paul Marchant, Leeds Metropolitan University

SUMMARY

— Science should most certainly be at the heart of Government policy.

— A Department for Science could be useful in promoting science.

— Science needs to be rigorous rather than just look "scientific".

1. I fully support the proposition that science should be at the heart of government policy. A Department for Science promoting science could be useful in encouraging a scientific outlook in society at large. (A Department for Science should not try to firmly control the country's scientific activity however.)

2. Throughout my writing I use "science" to mean rigorous scientific thinking based on well collected data (rather than any particular set of facts derived from scientific investigations).

3. The key point is that the scientific process needs to be rigorous. There is an ever present danger that the language of science is utilised for "spin" (ie PR, advertising, lobbying) when in fact the underpinning reasoning and/or data is flawed. That is the "the science brand" can be invoked to push a particular cause even when the underpinning is unscientific. Statistical reasoning needs to be thorough and conflicts of interest need to be minimised. In addition to good quality research we also need transparency about how research is commissioned and undertaken, and by whom.

4. I made a submission to a forerunner of the present DIUS committee, the Science and Technology Select Committee, in 2003 in its investigation on Light Pollution and Astronomy. I was pleased that the Committee agreed with my sceptical view on the claim that lighting is required to reduce crime. The Committee's Report stated "the correlation between lighting and crime is not conclusive" (Para 74 p27 of HC747–1) by looking at the data and reasoning behind the claim promoted by industry.

5. The issue of the relationship between lighting and crime illustrates the nature of scientific evidence. Assertions on this subject tend to have been made on a poor scientific basis. I submitted evidence to the Science Review of the Home Office and the Ministry of Justice, by the Government Office for Science, on experiencing weaknesses. See my written evidence www.berr.gov.uk/files/file44678.doc . (It is worrying however that the lighting claim is still made by proponents in spite of poor method and data.)

6. My piece (Chapter 7) in the Proceedings of the 6th European Dark-Skies Symposium http://www.britastro.org/dark-skies/cfds2006/proceedings.pdf also gives some points on how conclusions of research can be made more secure and threats to the integrity of science may be reduced.

7. It has been alleged that some of the key work claiming that lighting reduces crime was undertaken and also commissioned by the wife of the director, major shareholder and CEO of a major street lighting company and that the perceived conflict of interest was hidden, even when she was working on the issue as a civil servant (*Private Eye*, "Conflicts of Interest: Let there be light", Issue No. 1142, p28, 30th September 2005.) Clearly activity such as this, if it occurs, undermines science and confidence in it.

8. I use lighting and crime as an example as it is an area which I have investigated and something which some members of the DIUS Committee have previously looked at, but the general point about the importance of rigorous scientific work to establish trustworthy outcomes will apply to all areas of policy formation and implementation.

9. Major consequences and large sums of money can hang on the outcomes of research so we need to be sure that we have proper science and not material which merely looks scientific, at the detriment of society at large. Hopefully a Department for Science would press for sound science being employed throughout all policy areas.

10. I have not written explicitly about engineering as my main point is to encourage the rigour of sound scientific thinking. I do however support encouragement for engineering, as the practise of the discipline involves scientific thinking. Also making "things that work" is worthwhile in itself.

January 2009

Memorandum 32

Submission from SBAC

SBAC is the UK's national trade association representing companies supplying civil air transport, aerospace defence, security and space markets. Together with its regional partners, SBAC represents over 2,600 companies, assisting them in developing new business globally, facilitating innovation and competitiveness and providing regulatory services in technical standards and accreditation.

1. The SBAC welcomes the opportunity to respond to the inquiry, "Putting science and engineering at the heart of government policy".

SUMMARY

2. Science and Engineering should be at the heart of policy-making. SBAC supports the development of a National Strategy for Science and Engineering to bring together government, industry, academia and other stakeholders to devise the best way to fund science and engineering for the benefit of the UK.

3. SBAC does not see a need for a separate Department of Science at this time.

4. Current science and engineering policy is at best patchy and there needs to be more emphasis on the benefits that science and engineering bring to the UK.

5. Science and engineering research and training is at the core of the aerospace industry's development; as such our industry should be closely involved in the formulation of science and engineering policy. The Aerospace Technology and Skills Roadmaps should feed into these policies.

6. Early stage research in the aerospace industry is primarily funded through the Government's Technology Strategy Board. Successful consultation should reflect the needs of industry and incorporate the industry's Aerospace Technology and Skills Roadmaps.

7. SBAC's experience is that regional policies can fragment national progress in research and we do not recommend a regional science policy.

8. The Haldane principle should be updated to acknowledge the role that industry plays in furthering research.

9. The role that science and engineering play in the success of the UK economy is not understood by the public. The successful recruitment drive to ensure that there are more and better teachers of science and engineering, to capture and harness early enthusiasm in the classroom should be continued.

10. SBAC believes that engineers should be encouraged to obtain Chartered Engineer accreditation and that this professional status needs to be more widely understood.

11. A National Science and Engineering Strategy would bring together all stakeholders to determine science and engineering policy.

Should the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making?

12. Science and Engineering go hand in hand and should be at the heart of policy-making. Science and Engineering will play an important part in solving the problems of the 21st century such as global warming, reducing carbon emissions and encouraging growth through innovation.

13. The aerospace industry is a highly attractive and growing industrial sector. The UK has the largest aerospace industry outside the US and is potentially well placed to exploit further growth in the global marketplace. There are 9,000 supply chain companies throughout the UK regions. In 2007 the industry had a turnover of £20 billion and secured more than £44 billion in new orders. The industry exports 62% of all that it produces, contributing to a positive balance of trade. Alongside pharmaceuticals, aerospace provides important balance to the UK economy and sustains high value careers in design, research and engineering.

14. The aerospace industry directly employs 113,318 people, 18,449 of whom are focused on Research and Development activities. The sector employs 2,700 apprentices and 39% of all employees hold a university degree or equivalent.

15. Investment in research and development helps to sustain high-value jobs and increases the competitiveness of UK companies. Aerospace companies that find more beneficial research and development environments overseas are likely to move their R&D to other countries, with the consequent jobs being created outside the UK. Placing science and engineering at the centre of policy-making is likely to encourage aerospace companies to invest in the UK.

16. The UK aerospace industry is good at identifying future business opportunities and where research and development investment should be made to ensure that UK companies are best placed to win work on future programmes. The New Short Range aircraft is a significant opportunity for the industry and will be the replacement 100 seat aircraft that comes on stream in the next ten years. It is the focus for the development of new technology and environmental improvement that will deliver reductions in aircraft noise and gaseous emissions. It is a future market worth $600 billion over the next 20 years and is a major opportunity alongside Unmanned Aerial Vehicles, estimated to be worth £1 billion and rotorcraft. In conjunction with the government, the industry has identified the technology that needs to be developed to enable UK companies to compete for workshares on these programmes. These technology roadmaps define the specific technologies that need to be developed and the timeline for their development.

17. SBAC is currently building on this mapping work through developing a skills map that aligns with these programmes. This skills roadmap will define the needs of the industry according to future programmes and will be an important tool for both government and industry to invest in the right training programmes at the right time.

Should there be a Department for Science?

18. The reorganisation of government departments to create the Department for Innovation, Universities and Skills signalled a change in direction to give a greater emphasis to innovation and industry. Separating skills from education has recognised that skills continue to play an important role in the UK economy and that knowledge should extend beyond the formal education system.

19. Although SBAC welcomes the suggestion that science should be important enough to have its own department, we are concerned that creating a Department for Science is likely to contribute to additional administrative expenditure and money targeted at assessing science and engineering rather than supporting or promoting it. SBAC does not feel that this would be an effective use of government investment. Equally, if a Department for Science were established, it would need to include Engineering to ensure joined-up thinking about new technologies and to ensure that scientific advances are developed into innovations that benefit the UK economy.

20. SBAC would however welcome the development of a National Agenda and Strategy for Science and Engineering. This would encourage all government departments associated with science and engineering to work together to create outputs that will deliver the innovation and technology programmes that are required by the industries of the UK.

Comments on the way that Government formulates science and engineering policy (strengths and weaknesses of the current system)

21. SBAC believes that current science and engineering policy is patchy and would benefit from greater emphasis on the advantages that engineering brings to the UK economy. Government should work with industry to provide a real opportunity to develop a coherent and holistic policy.

22. Currently the many initiatives, themes and programmes located around science and engineering are often forced to fit the funding regime. This results in projects being developed in ways to ensure that they are funded rather than developing research programmes to fit the needs of industry. A National Strategy for Science and Engineering would help to determine priority areas for research and would then ensure that they are funded.

Should the views of the science and engineering community be central to the formulation of government policy?

23. SBAC believes that the aerospace industry's contribution to the UK economy, its position as the second largest aerospace industry in the world and as an employer and exploiter of the UK science and engineering capability means that the industry is well placed to make a positive contribution to the Government's policy on science and engineering.

24. The Aerospace Technology Roadmaps which define the technology that needs to be collaboratively funded and developed to ensure that the industry it is best placed to compete for work on future programmes are mature. They provide an important basis for informing decisions on civil aerospace collaborative research, development and demonstration programmes. to maintain the UK knowledge base and further lead to UK high value manufacturing.

25. Synergies between the National Aerospace Technology Strategy and the Defence Technology Plan are being sought to ensure effective and efficient utilisation of both government and industry investments.

26. A Skills Roadmap is also being developed by SBAC to determine the future skills needs of the aerospace industry. SBAC believes that the Roadmaps are a significant contribution that the aerospace industry is able to contribute to the formulation of government policy.

How should the success of any consultation be assessed?

27. SBAC believes that the success of consultation can be assessed in two ways. Successful consultation would result in government policies that reflect the experience of the aerospace industry and respond to the industry's needs. This would also mean that the aerospace industry would have an understanding of the reasoning behind policies that did not reflect their needs.

28. The Aerospace Technology Roadmaps and the Aerospace Skills Roadmap are designed to create an effective demand signal from the aerospace industry. Successful consultation would refer to these Roadmaps and would incorporate the demand signal into government policy.

Is there a case for a regional science policy versus national science policy?

29. SBAC has received no pressure from member companies or affiliated member trade associations making the case for regional science policies. We believe that it is the role of the Regional Development Agencies to emphasise their regional needs within the context of national strategies.

30. There has been some concern from SBAC members that the shift in funding from national initiatives such as the Civil Aeronautics Research and Technology Demonstration (CARAD) Programme to regional funding programmes has had an adverse effect, resulting in increased administration costs and "internal" competition between regions, both being detrimental to execution. SBAC's members are concerned that regional funding regimes have necessitated multiple applications in order to amass the funding for a single programme. The process of large programme application is currently taking on average 12 months of reiterative discussion which in turn could jeopardise entire research programmes. SBAC is a globally competitive industry and the complexity of applying for support for research does affect UK competitiveness.

31. SBAC believes that there are advantages to be gained from a National Agenda and Strategy for science and engineering which builds upon the initiatives that have already been developed in industry sectors such as aerospace. This should be seen as a framework at a regional level in a similar fashion to the regional implementation of the National Curriculum.

Does the Haldane principle need updating?

32. SBAC believes that the Haldane principle does not acknowledge industry's contribution in leading and funding research initiatives. We acknowledge that pure research is necessary to advance scientific and engineering knowledge, and we also acknowledge the role that this plays in the advancement of engineering technologies. We believe that research, development and demonstration is best shaped by collaboration of industry, government and academia and that government and research council investments should be more closely aligned to collaborative national strategies such as NATS.

33. We believe that a National Science and Engineering Strategy would stimulate cohesion between the Research Councils, Government and Industry. This would allow scientific and engineering frontiers to be advanced without political interference and would also be a mechanism to determine the funding and direction of research for the benefit of the UK economy.

Engaging the public and increasing public confidence in science and engineering policy

34. SBAC believes that the public are "put off" by science and engineering and have little understanding about the contribution that engineering continues to make to the wealth and success of the UK.

35. There is a public perception that science is hard and engineering is dirty. Clean rooms, light and airy facilities with computer aided machines are now the norm and many scientists and engineers spend much of their working time in offices or at a computer.

36. Science and engineering is often down-graded as "the techie bit". There are many "pseudo-science" stories in the media, often focused on areas such as food and medical scares, or purporting to have come up with a formula for subjects such as the "perfect shower" or the "perfect joke". These are reported without criticism and can lead to misunderstandings. Genuine advances in science and/or engineering are either reported sensationally or not reported at all.

37. A greater understanding of the importance of science and engineering to the regeneration and sustainability of our economy would also encourage more young people to enter science and engineering careers. More funding should be directed towards the teaching of Science, Technology, Engineering and Mathematics and incentives should be provided to industry to encourage collaboration with and support for local schools and colleges.

38. SBAC's work with children at primary level shows that the wonder they express at space technology and aeroplanes in flight can be lost in the classroom at secondary level as the education process is often unrelated to the application of science and engineering. SBAC welcomes the significant steps that have been taken to address shortages of well-educated science and maths teachers in schools through the "those who can, teach" campaign, and proposes that similar campaigns should be developed for prospective further education programmes. We encourage the government to continue its recruitment drive to ensure that children are receiving the most stimulating science and maths teaching possible.

39. SBAC also welcomes the reintroduction of separate science teaching into secondary education and sees this as a positive step to enable the up-take of science subjects.

40. SBAC has also discovered that good, enthusiastic teaching showing how scientific and engineering principles can be applied to pupils' real life experience, results in more students studying science and engineering at higher levels. Many of our members are working with schools to deliver the Engineering Diploma.

41. Engineering is perceived not to be well-paid in comparison with highly lucrative occupations such as finance and there is little understanding of what engineers do on a daily basis. This leads to a lack of interest in pursuing a scientific or engineering career.

42. There is an ongoing debate about the professional status of engineers and in particular the use of the word "engineer" in job titles for job roles such as mechanics and heating systems installers. SBAC believes that ensuring that scientists and engineers at all levels are registered within an integrated and coordinated national framework based on robust entry standards and relevant continuous professional development, would improve the professional status of scientists and engineers. Chartered Engineering status (CEng) should be more widely publicised as a professional accreditation in the same way as professions such as law and accountancy.

The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy

43. SBAC believes that a National Science and Engineering Strategy should bring all these stakeholders together to determine science and engineering policy. SBAC is already working closely with government, industry, research and technology organisations and academia to create and develop the Technology Roadmaps and the Skills Roadmap. We believe that the production of the Roadmaps will set out the needs of industry and that these should contribute to determining UK science and engineering policy.

44. SBAC believes that these stakeholders reflect the wealth of scientific and engineering talent present throughout the UK. Bringing these stakeholders together will advance science and engineering policies to ensure that the UK remains at the forefront of innovation.

January 2009

Memorandum 33

Submission from the Association of Medical Research Charities (AMRC)

AMRC response to Commons Select Committee on Innovation, Universities, Science & Skills consultation "Putting science and engineering at the heart of Government Policy"

The Association of Medical Research Charities (AMRC) is a membership organisation of the leading medical and health research charities in the UK. In 2007–08 AMRC's 115 member charities spent over £900 million on medical and health research in the UK.[138]

Working with its membership and external partners, AMRC aims to:

- Provide services and support that enable member charities to be effective research funders.
- Demonstrate leadership in developing solutions to key issues and challenges facing the sector.
- Influence the external environment so that it is enabling of the work of medical research charities.

We are pleased to respond to this consultation, as detailed below. The comments here reflect the view of AMRC, based on our experience of working with and for our member charities and we have necessarily concentrated our submission on a number of key areas. We are aware that several of our 115 members intend to respond individually to the inquiry.

[138] Based on AMRC Member Subscription Data collected in 2008–09

Summary

— AMRC applauds the Government's ongoing emphasis on science, and welcomes the fact that the Science Minister is now included within cabinet-level discussions.

— We are concerned that the "economic" focus of the cabinet sub-committee on Science and Innovation is too narrow and that, strategically, science policy must also be considered in terms of its wider social and environmental impact and benefits.

— AMRC would instinctively welcome the idea of establishing a Department for Science and envisage that this would have many benefits for the advancement and promotion of science in the UK.

— AMRC continues to have concerns about the process by which science policy is developed. This could be more transparent and contributor-friendly, reflecting the important role played by many stakeholders outside Government including charities.

— We support the Haldane Principle as the underlying principle of Government policy-making in this area.

— We believe that parliamentary scrutiny of science could be strengthened and improved with the establishment of a dedicated Commons Select Committee and better research and support services for Parliamentarians.

— The overall aims of Government efforts to improve public understanding of science need to be more clearly defined and their implementation based on a strong partnership approach with other stakeholders.

Science and Engineering at the Heart of Policy-Making

1. AMRC welcomes the current cross-government focus on science including the appointment of the Science Minister to cabinet and the establishment of a Cabinet Sub-Committee on Science & Innovation. Both steps will, we believe, help to ensure that science and engineering is at the heart of policy-making and overall Government strategy going forward.

2. However, we are concerned at the ongoing emphasis on the economic benefits of science and innovation to the potential exclusion of the consideration of wider social and environmental benefits. For instance, we consider the terms of reference for the Cabinet Sub-Committee on Science & Innovation, "*To consider issues relating to science and innovation; and report as necessary to the Committee on Economic Development*", to be too narrow. The recent report *Medical Research: What's it worth?*[139] commissioned by MRC, the Wellcome Trust and the Academy of Medical Science, shows that there are clear long-term social as well as economic benefits from investing in medical research. And while we understand the Government's concerns over economic impact, particularly given the current external environment, we strongly believe that policy discussions at every level need to reflect the wider impact of research and science and society's needs at any given time.

Departmental Responsibilities

3. With the establishment of the Department for Innovation Universities and Skills (DIUS) in 2007, the scientific community gave the new Department a cautious welcome while emphasising the importance of it having strong cross-departmental links to enable it to work effectively for science. In our view, it is perhaps too early to judge how successful the Department has been in achieving this. However, our sense is that there has been a loss of momentum on some issues due to the changes in departmental responsibilities and the implementation of arrangements for their ongoing management and handling.

4. AMRC would instinctively welcome the idea of establishing a Department for Science. In the experience of our member charities, difficulties often arise for those trying to feed into the policy-making process in ascertaining which department is leading on particular issues and where their voice can be heard most effectively and constructively. For example, responsibility for animal research stretches across several departments, including the Home Office, DIUS and BERR, but it is not always clear which department has had authority on a particular issue or policy development.

5. A Department for Science with a remit to provide leadership across government, forge strong cross-departmental links and ensure consistency of approach and thematic emphasis would ensure that the Government's approach and decision-making apparatus was more open and transparent to all stakeholders.

6. What we would not want to see is the establishment of a Department for Science in a solely cosmetic sense with no consideration given to the mechanisms and vehicles by which it will champion science across Government. The inherent risk of establishing a single department is that it would create the policy equivalent of a centrifugal force in Government which would lessen or disempower the consideration of science issues by other departments. It should also not disassemble or attempt to assume ownership of

[139] *Medical Research: What's it Worth?,* November 2008— http://www.wellcome.ac.uk/About-us/Publications/Books/Biomedical-science/WTX052113.htm

effective mechanisms set up by other Departments, such as the Office for Strategic Coordination of Health Research (OSCHR) and UK Clinical Research Collaboration (UKCRC), to develop strategy and policy on science and research issues (see below).

Policy Formulation

7. In the medical and health research arena the main thrust of Government policy, as enshrined in Cooksey and OSCHR, is well-aligned and responsive to the priorities of the scientific community. AMRC welcomes the partnership approach embodied within the mission of UKCRC which has created an effective forum in which to develop a coherent approach to funding health-related research and the practical steps taken by OSCHR to actively involve all stakeholders this year, including medical research charities, in setting National Ambitions on Health Research.

8. In general we would say that as regards other science policy areas the Government has also endeavoured to be inclusive of the relevant stakeholders throughout policy development on key issues. The Foresight programme, for instance, has been an excellent example of how the community can be brought together to examine key issues and challenges and define an agenda for the long-term.

9. What has been less transparent and inclusive at times has been the Government approach to implementation of policy. Here the goal should be the establishment of mechanisms to gather views across the scientific community as policy is put into practice. Many key stakeholders are resource-poor and the process of contributing to policy implementation can be overwhelming. Again, a single Department for Science could considerably improve this situation by ensuring a more uniform engagement process rather than requiring contributors to monitor and develop relationships with several departments.

Scrutiny

10. To provide effective scrutiny of detailed science policy it is necessary to have access to specialist science knowledge. Although many laudable steps are taken by Parliament to ensure Members have access to scientific information, including the Parliamentary Office of Science & Technology and a team of specialists on hand in the Commons and Lords library, it is the case that Members of Parliament must proactively seek out this information. Often faced with multiple demands on their time and limited staff capacity, this is not a priority.

11. Currently a wide-range of mechanisms exist which Parliamentarians can access if they are aware of them to obtain information about science—including the library, POST, Foresight, All Party Parliamentary Groups etc. However, the sheer volume of avenues can potentially be over whelming and run the risk of repetition. Within any effort to review scientific advice to Parliamentarians, AMRC would welcome an attempt to co-ordinate and streamline such efforts. AMRC recognises the similar thinking outlined in the Commons Public Administration Committee's second report of 2006–07, *Governing the Future,*[140] which stated:

> " *… Members' capacity to engage with outside experts and the wider public could usefully be increased, perhaps by building on the work done by POST to produce something more like the Scottish Parliament's Futures Forum, where debate can be informed by experts, and can involve those outside Parliament itself."*

and would welcome further exploration into developing such a forum to improve Members' capacity to engage with outside experts and the wider public on science issues.

12. During the passage of the Human Fertilisation and Embryology Act 2008 through Parliament, medical research charities, working closely with the medical research community, expended considerable effort to ensure all Members were aware of, and had access to, detailed briefings on the science. However, it may not always be possible for expert groups external to Parliament to expend the time, effort and resources required to pro-actively engage with Parliamentarians on a particular policy issue. Nor would these necessarily be seen as impartial sources of information and Parliamentarians lacking fluency with the scientific method may also be at the mercy of groups with other agendas who profess expertise. AMRC would welcome steps to strengthen the Commons and Lords library and other resources to enable Parliamentarians to identify and pro-actively engage on upcoming policy issues.

13. Furthermore, we believe that political parties themselves could do more to empower their members to be "science savvy" so they are in a position to scrutinise science policy more effectively. AMRC therefore applauds the Conservative party initiative[141] to provide Conservative Parliamentarians with lessons in scientific literacy, explaining scientific method and basic concepts, and urge Parliament to consider similar pro-active engagement with all Parliamentarians on science.

[140] House of Commons Select Committee on Public Administration—*Governing the Future,* Second Report 2006–07, recommendation 16 —http://www.publications.parliament.uk/pa/cm200607/cmselect/cmpubadm/123/123i.pdf
[141] *Times*, Nov 2008 http://www.timesonline.co.uk/tol/news/uk/science/article5168006.ece

14. AMRC believes that the Haldane Principle should continue to be the underlying principle for government decision-making on science although we would welcome a more open public debate about whether these need updating for the future.

15. The effectiveness of the Haldane Principle in practice, however, rests on there also being effective checks and balances across the policy-making process, including Parliament.

16. While we applaud the work of the Innovation, Universities, Science and Skills Committee in scrutinising science policy across Government, we recognise that this is just one part of the committee's very large remit. Indeed, we were disappointed that the decision was taken not to retain a dedicated Commons Science Select Committee following the changes in the machinery of Government in 2007 and continue to believe that there should be a Commons Select Committee established to scrutinise and examine science policy and issues in more detail, regardless of whether a Department for Science is established in the future.

17. As the Minister for Science currently sits in the Lords and, therefore, is not able to answer MPs questions in the House, we hope the Committee for Innovation, Universities, Science and Skills will re-instigate regular oral evidence sessions with the Minister for Science.

Engaging the public

18. While laudable, the overall aims of the Government's aspiration " … for all citizens to be fully engaged with science and to understand the nature of science better" (*A Vision for Science & Society DIUS Consultation,* 2008) need better definition particularly in terms of how Government intends to measure impact and work in partnership with others.

19. We believe that more detailed public polling is needed to explore what the public might want to see to make them feel more confident in science and to inform more realistic goals and strategies for public understanding and dialogue. What is apparent from public dialogue work to date on specific health research issues such as ageing[142] and stem cells[143] is that there is a real need for efforts to be focused on improving public understanding of how research happens in practice—including not just realistic processes, timescales and goals, but co-ordination between funders including the involvement of industry as research partners throughout the process etc.

20. In our view the focus on the notion of "scientific literacy" does disservice to the public's clear interest in, and thirst for information on, research as highlighted by AMRC's public polling and dialogue work.

21. An Ipsos MORI poll commissioned by AMRC in October 2008 showed that a majority (57%) of British adults 15+ have donated money to a medical research charity suggesting such charities are highly valued by the public. When further questioned "How interested are you in medical research in general?" 58% responded that they have an interest in this area.[144] This suggests there potentially is a large audience for initiatives to engage the public with medical research.

22. Medical research charities—already inspiring high levels of confidence and support from the public—can play a key role in engaging the public with science as the recent BBSRC/MRC funded *Stem Cell Dialogue* report[145] recommended: "There is a significant opportunity for a coordinated campaign by medical research charities to raise the resources and profile of stem cell science."

23. Moreover the myriad efforts on public understanding and engagement undertaken by many organisations could benefit from a level of strategic co-ordination and leadership which the Government is well-placed to facilitate and AMRC would welcome the inclusion in the developing Science & Society policy of steps to support and promote such co-ordinated engagement.

24. More provocatively, it is interesting to us that the notion of a civic society, apparent in the policy-thinking of other departments, has not translated across to DIUS and the formulation of science policy. Hierarchical notions and assumptions around engagement with a "scientifically illiterate" public persist with no notion of what the supposed goal of a scientifically literate public might look like in practise. In our view, this prevents a more open-minded approach to improving public understanding through greater public involvement and participation which will benefit both science and its end-users.

[142] BBSRC, MRC, RCUK, *Public Consultation of Aging,* http://www.mrc.ac.uk/Utilities/Documentrecord/index.htm?d=MRC004678

[143] BBSRC, MRC, ScienceWise, *Stem Cell Dialogue,* Dec 2008— http://www.bbsrc.ac.uk/society/dialogue/activities/stem_cell_final_report.pdf

[144] Question: Some medical charities concentrate on providing care, information, education, doing medical research. Would you be more likely or less likely to give money to a charity that uses its donations to pursue medical research into a cause or cure? Results: very interested 12%; interested 46%; not very interested 30%; not at all interested 10%; don't know 2%. Interested (net) 58%; not interested 41%

[145] BBSRC, MRC, ScienceWise, *Stem Cell Dialogue,* Dec 2008— http://www.bbsrc.ac.uk/society/dialogue/activities/stem_cell_final_report.pdf

AMRC and its members welcome the Committee's inquiry and will be happy to assist the Committee further in its deliberations in any way it can.

January 2009

Memorandum 34

Submission from the Campaign for Science & Engineering (CaSE)

Introduction

1. The Campaign for Science & Engineering in the UK (CaSE) welcomes the opportunity to provide written evidence to the Innovation, Universities, Science and Skills Committee inquiry into *putting science and engineering at the heart of government policy*. CaSE has been influencing UK science and engineering policy since its inception in 1986 as Save British Science.

Summary

2. CaSE believes that science and engineering should be put at the heart of government policy through:
   - political commitment to science and engineering
   - having science and engineering as a cabinet-level issue
   - cross-government and departmental focus on science and engineering
   - moving the Government Chief Scientific Adviser and Government Office for Science to the Cabinet Office
   - significantly strengthening the Council for Science and Technology
   - a cross-government science and engineering policy
   - greater transparency regarding the guidance given from the government to research councils
   - continued pressure from the science and engineering community
   - re-establishing the House of Commons Science and Technology Committee

Political Commitment

3. Without strong political support science and engineering will never be at the heart of government policy. For this reason CaSE works with all political parties across the UK to ensure that they understand the importance of science and engineering and the important roles that government and parliament can play in its success.

4. There are two general types of government science and engineering policies: those that influence science and engineering and those that are influenced by science and engineering. High-level political commitment is needed to develop both types. The first requires farsighted investment in people and infrastructure. The second is dependent on having the first in place and also the advisory mechanisms and openness to integrate evidence into policy decisions.

5. Although this inquiry is mainly focused on organisational issues and processes it is important to note that the success or otherwise of putting science and engineering at the heart of government policy is dependent on the personal commitment of high-level individuals within government and other relevant bodies.

Machinery of Government and Science and Engineering Policy

6. The machinery of government is a critical factor in ensuring that science and engineering are at the heart of policymaking. The Prime Minister has made a number of significant changes to the organisation of science and engineering policy within government.

Cabinet

7. The appointment of Lord Drayson to the Cabinet and the National Economic Council is a significant upgrading of the position of minister for science and innovation. It is a prerogative power of the prime minister to determine his or her cabinet, but CaSE will advocate that future prime ministers make science and engineering a Cabinet-level issue as we have done in the past.

8. The creation of the science and innovation cabinet sub-committee is a welcome development. It is critical that the committee meets frequently enough to develop a cross-government perspective on science and innovation. The composition of the science committee should be expanded to include a minister from the Department for Culture, Media and Sport and the Foreign and Commonwealth Office. As cabinet committee discussions are not made public it is difficult to make an external assessment of its workings.

Departmental responsibility for science and engineering

9. Science and engineering will always need to be a cross-government priority. One department can never be wholly responsible for science and engineering. Each department needs to be responsible for their own science and engineering research needs and internal advice. Also, lines will always have to be drawn between departmental portfolios with an impact on science and engineering as varied as education, business, immigration and culture.

10. Although science and engineering policies are spread across government it also needs to be a prominent part of a single department. A Department for Science and Engineering would have a number of obvious benefits. First, there would automatically be someone at the Cabinet speaking for science and engineering. It could also foster better integration of certain science and engineering policies and regulations. An assessment would have to be made about what functions from other departments would be integrated into such a Department, one possibility would be the Home Office's regulation of animal research. It would also be necessary to guard against departments downgrading the importance of science and engineering in their own portfolios, as the Foreign and Commonwealth Office recently did.

11. The Department for Innovation, Universities and Skills (DIUS) incorporates many of the elements that should be within a Department for Science and Engineering. Science should have been included within the name of the department to reflect its prominence. One critical area that DIUS needs to strengthen is its collaboration with other departments. Particularly, the Department for Business, Enterprise and Regulatory Reform on business research and innovation and the Department for Children, Schools and Families on science and mathematics education in schools.

Government Chief Scientific Adviser and Government Office for Science

12. The Government Chief Scientific Adviser (GCSA) has a critical role in putting science and engineering at the heart of government. However, it would be appropriate for the GCSA and the Government Office for Science (GO-Science) to be moved from the DIUS to the Cabinet Office, because both are meant to support the Prime Minister and Cabinet and strengthen the Civil Service. It would also mean that all departments would be engaged with equally as it is of critical importance that scientific, engineering and technological advice is at the highest levels of government and across it.

13. Government departmental funding of research needs to be given a higher profile. The GCSA and GO-Science need to keep challenging departments about how they are utilising science and engineering to meet their departmental objectives. The Committee of Chief Scientific Advisers should consider developing a cross-government strategy on departmental funding on R&D.

Council for Science and Technology

14. The Council for Science and Technology (CST) is an important body that has been under-utilised. Its primary role is to advise the Prime Minister and leaders of the devolved administrations on science and technology policy. The CST has an extremely important role in challenging government and devolved administration science policies and providing advice on high-level issues. It is also well placed to look at the linkages between UK-wide and devolved science policies.

15. The CST needs to be strengthened in order to have a greater impact on science and engineering policy. One organisational model that could be learned from is the Sustainable Development Commission, which is the government and devolved administrations independent adviser and watchdog on sustainable development. A revamped CST could produce authoritative policy reports, statistical analysis and comment upon progress across against government and devolved administrations commitments. Council members would need to give more of their time and the secretariat would need to be strengthened, including offices in the devolved administrations. A revamped CST would help to ensure that science and engineering is put at the heart of government policy and that the government delivers upon its ambitions.

Formulation of Science and Engineering Policy

16. There are various science and engineering policies across the UK government, devolved administrations and agencies. It is critical that there are appropriate strategies, policy initiatives and funding to deliver the political ambition to make the UK a world leader in science and innovation.

17. DIUS has the lead responsibility, but other departments also make significant contributions to science and engineering policy. HM Treasury plays a critical role in the UK's science and engineering policy. It was central to the development of the Ten-Year Science and Innovation Investment Framework 2004–14, which remains the most important science policy document in the UK. The outcomes of Comprehensive Spending Reviews and Budgets are critical to achieving the goals set out in the Framework.

18. The UK has many science and engineering policies. In addition to the Ten-Year Framework there are a number of other key science policies. Although *Innovation Nation* was billed as a science and innovation white paper, its focus was mainly on innovation. The Sainsbury Review is another part of the UK's science policy framework. A Science and Society Strategy is also under-development. The Government should develop a cross-government science white paper in due course to put science and engineering at the heart of government policy. This could also be one way of responding to the proposals that will inevitability develop from this inquiry.

19. In addition, other departments should pay more attention to how their policies affect the Government's ambition for science and engineering. One recent example was highlighted in CaSE's policy report *International Excellence: Valuing International Scientists and Engineers*. The report found that the Home Office's Points-Based System for immigration was not fully in-line with making the UK a world leader in science and innovation as it had negative impacts on the UK's ability to attract scientific talent from around the world.

Regional Versus National Science and Engineering Policy

20. It is critical that UK-wide science policy decisions, especially the funding distributed by research councils, are made on the basis of merit. There are relevant reasons for taking geographic distribution of research council facilities into account when there is scientific justification (eg, the long-term monitoring of environmental change).

21. The UK does have devolved science policies. The Scottish Government published its strategy *Science for Scotland* in November 2008 and the Welsh Assembly Government published its *Science Policy for Wales* in 2006. Northern Ireland does not yet have a science strategy. It is important for devolved administrations to have science policies as they have responsibility over key areas of research funding, education and enterprise.

Haldane Principle

22. As the Committee noted in its inquiry into the Science Budget Allocations the Haldane principle needs to be refreshed if it is to be a meaningful part of UK science policy. As there is currently no agreed definition of the Haldane principle there is much scope for interpretation about what it means and how it should be applied.

23. The Haldane report made the distinction between research funding for general use, that should be free from political direction, and research for specific policy use, that should be administered by a department. The growth of the science budget at the same time as most departmental budgets have stagnated, has meant that the government has looked towards research councils and universities to deliver more of their evidence needs. Departments should recognise the need for investment in policy-oriented research as part of their responsibility and legitimate call upon their budget.

24. The Secretary of State, John Denham, gave his definition of the Haldane principle as:

- Researchers are best-placed to determine detailed priorities
- Government's role is to set over-arching strategy
- Research Councils are the "guardians of the independence of science"

25. This definition is a good starting point for discussion. However, it cannot be the final word as there is a large grey area of decisions that are between a detailed priority and an over-arching strategy, which makes the definition virtually meaningless. What needs to be clarified is the level of autonomy that the research councils have in setting their strategic direction.

26. Because of the lack of transparency in the science budget allocation process it is difficult to determine if a decision was made by a research council or the government. A useful step would be for the government to publish any guidance it gives to research councils. CaSE has lodged a Freedom of Information request to make the Allocation Letters from DIUS to each research council public. This was done to find out what level of formal guidance was given to research councils regarding how they should allocate their funds and

to ensure that subsequent guidance was made a matter of public record. This would better enable the science and engineering community and parliamentarians to scrutinize the allocation of science budgets. DIUS is still considering the request.

Stakeholder Involvement in Science and Engineering Policy

27. The scientific and engineering community, including universities, industry, research charities and learned societies, should be central to the formulation of government policy. They should be engaged in the formulation of both policies that affect science and engineering and policies where science and engineering evidence and advice should be brought to bear on their development.

28. CaSE plays an important role in terms of science and engineering policy. Our membership brings together individuals and organisations from across the broad science and engineering community. Our work focuses on influencing high-level science and engineering policies across the UK. We do this by producing policy documents, organising discussion meetings and engaging politicians, civil servants and the media on key science and engineering policies.

29. CaSE has a unique history. We were founded in 1986 as *Save British Science* (SBS) by scientists, engineering and mathematicians to secure greater political support and funding for research and education. SBS/CaSE has contributed to raising the political profile of science and engineering and shaping the science policy agenda, such as the recent sustained increase in the science budget, expansion of Chief Scientifics Advisers, and highlighting deficiencies in science and mathematics education. Outside pressure is critical to keeping science and engineering up the political agenda.

30. Since SBS/CaSE's formation there are more stakeholders with an active interest in science and engineering policy. The government should take a more active and imaginative approach to bringing together the science and engineering community to discuss and agree shared priorities. The CST could develop as a useful facilitator in making this happen.

Scrutiny of Government Science and Engineering Policy

31. CaSE believes that a Science and Technology Committee should be re-established in the House of Commons. Parliamentary scrutiny benefited from having a Science and Technology Committee that was able to look at both the department with responsibility for the science budget, related organisations and science and technology issues within other departments and across them.

32. The addition of "science" to the Innovation, Universities and Skills Committee was a welcome development. The IUSS Committee to-date has covered a number of important science and technology issues. The Committee's coverage of science and technology has benefited by its membership being made up of many members of the former Science and Technology Committee.

33. The IUSS Committee's remit is to scrutinize the work of DIUS. Although the Committee could use its powers to investigate the Government Office of Science to examine science and engineering issues in other departments its workload has greatly increased making it harder to cover science and engineering policy across government. The Science and Technology Committee was often very effective in investing those sort of issues (eg, research within the Department for International Development).

34. The IUSS Committee should follow the recommendation within the Science and Technology Committee's Last Report to have a periodic Science Question Time to ensure that the work of the Science and Innovation Minister is properly scrutinized. This is particularly important when the Minister is appointed from the Lords.

January 2009

Memorandum 35

Submission from the Board of the Regional Studies Association

Introductory Remarks

We were very pleased to have the opportunity to make a response to this consultation in our positions of Board Member and Chief Executive of, the Regional Studies Association. In making some comments we have chosen to concentrate on the issue of the case for a regional science policy versus a national science policy and whether the Haldane principle needs updating. We hope that you will find our comments constructive and helpful.

Background—The Regional Studies Association

The Regional Studies Association is a learned society working at the interface between regional development, policy and research. We were founded in the early 1960s in direct competition to the American-founded Regional Science Association (now Regional Science Association International). Our Association was uniquely different to this organisation in that, coming at a time when the British Government was seeking to introduce a National Plan with concomitant regional planning bodies and interventions, the founding members were clear that a part of the role of the new organisation would be to interface with those in the policy and practice communities and to seek to inform, through the provision of evidence, the decisions that were taken. A key part of this aim was the deliberate inclusion of non-academics within the membership body at both individual and corporate levels. This background flavours much of what the Association thinks is important today.

The Association today is very much international in membership, reach and ambition. Our publishing programme is international particularly through our two journals, *Regional Studies* and *Spatial Economic Analysis*; our major annual conference takes place in continental Europe each year (Leuven, Belgium, April 2009) and the Association has organised, and will continue to organise, events in North America. Our improved financial position over time means that we are now able to fund research networking activity and are currently supporting fifteen groups on topics such as *Mediterranean and Balkan Regional Development*; *Theorising Regional Development: the theoretical background of new concepts in regional studies*; *Green Regional Innovation: Entrepreneurship and Governance* and *Bridging old and new divisions in regional governance between "core" and "periphery" in Europe's East and West*. The Association is very keen that no-one be excluded from its activities and to that end has introduced territorial membership pricing and conference attendance fees for its annual conference based on GDP on a price parity basis. We have recently launched a new and ambitious Development Plan setting out our aims for the years to 2013. Key among these aims is the influencing of policy debate and practice. We have attached a copy of the plan to give you more information but in short we are to:

- Promote the use and uptake of regional studies research and knowledge in public and political fora so as to influence policy and practice;
- Provide policy makers, academics, practitioner, public bodies and opinion formers with informed views about regional issues;
- Engage with the media to ensure that views from the Association are represented and that information on regional studies research and knowledge is readily available; and,
- Encourage debate across nation states at the international scale.

The comments which follow are couched very much in terms of our field of expertise and interest—the relationship between space, place and regional development. They also draw on papers published within Regional Studies in a special issue entitled *"Governance, Science Policy and Regions"* (Volume 41, Number 8th November 2007).

Evidence

Our submission here is primarily focused on "the case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating", and the related issue of the role of different stakeholders, particularly at sub-national level, in "determining UK science and engineering policy".

A core issue and concern of RSA members for many years has been the uneven distribution of R&D and innovation between regions in the UK. Work published by the association in its journal Regional Studies over many years has mapped out these uneven distributions and some of the causes within the UK. Indeed one of the first published papers on this topic was published in Regional Studies in 1970 (Buswell and Lewis). In particular the role of central government in establishing its own R&D facilities, government procurement contracts, and higher education policy have all played a part in the creation of a concentration of R&D in the South of the UK, with relatively poor levels of performance in the North and periphery. The current pattern is the legacy of policies over many decades—Carol Heim(1988) showed from public records how decisions on the locations of public research facilities in the 1950s were biased in favour of the South for reasons which would now be politically unacceptable. The combination of public research facilities and elite universities in the South has greatly strengthened the science infrastructure in those regions. In the North and periphery of the UK the weakness of the regional innovation system is a major problem in the economic performance of these regions, and limits the UK's ability to match the national level of R&D in GDP of our main competitor nations, our innovativeness in manufactured products in particular, and ultimately national productivity. Science and research in the regions outside of the golden triangle is heavily focused on the universities and a weak public sector combined with a weak private sector limits the possibilities for endogenous development.

In this the UK can be contrasted with a number of other countries—Germany and Finland for example where both public and private research activity is much more widely distributed and also at a higher absolute level. In federal systems of government such as Germany, but also the US, Australia and increasingly Spain, there is often a greater role for the regions or states in research and science policy, and there is a stronger link between the investments made in regions and the development of regional innovation systems. The UK

is becoming a partial federal system, with the devolved nations pursuing their own science and innovation policies, but with an ambivalence in England as to the need for a regional role in science. Thus Scotland is in a position to develop its own science strategy encompassing public research, university research infrastructure and economic development incentives, but the Northern regions of England lack these powers and see little direct support from national government for increased science. The six Science Cities could provide such a focus but as yet have seen no new money, other than that available through the RDAs.

Thus we would argue that there is a need for a less uneven distribution of research in the UK, which implies a change in science policy to a position that favours some new investment in those regions which are currently lagging. There are three principal issues that need to be addressed in that though: the difficulty of relocating existing research activity, the importance of critical mass, and the challenge to the Haldane principle that decisions on science investments should be made on scientific grounds by scientists and not for political reasons.

First, on the issue of relocation, there has been some relocation of R&D in recent years, although little of this has benefited the regions with low R&D. Indeed the privatisation of the utilities and some government research centres saw a reduction of employment in research in the peripheral regions, with the North West and North East particularly losing out. Overall government has reduced its own internal research activity in recent years placing a stronger emphasis on the universities to undertake basic research leading to long term economic spillovers. In many of our competitor countries we see government playing a stronger role in supporting the development of new technologies, and this often being supported by regional governments—whether the German Laender, Catalonia, US states or Australian states such as Queensland and Victoria. Both Catalonia and Victoria have been involved in funding synchrotron developments for example. As part of a long term investment in science government could look at new regionally devolved infrastructures which complement the work of the universities and help to underpin regional development strategies.

Another argument that is often levelled at any discussion of greater decentralisation of research is the need for critical mass. It is clear that parts of the UK do indeed have critical mass in international terms through a concentration of public, private and university research. Given that there is an acknowledged need to increase the level of R&D in the UK, which may imply additional public sector investment, then should additional resources be placed in these existing concentrations—on the basis that economies of scale and scope will produce better outcomes—or should they be used to develop new concentrations elsewhere. The recent evidence from the RAE suggests that excellence can be found in most places, at least within the University system, but there is no real evidence that further concentration will yield better scientific outcomes. To some degree further concentration can lead to diseconomies of scale as all the usual consequences of congestion kick in. High living costs, high labour turnover, long commutes, and limited space for new businesses may reduce the long term impact of new investment. Building new concentrations of research in the English provincial cities, linked for example with the Science City initiative may offer greater potential for transformation and impacts on productivity.

This then raises questions about the kind of science that should be located in different regions and therefore the decision making processes involved and who should be involved in those processes, and inevitably the Haldane principle, where it should apply, and whether a modified version is needed. The Haldane principle is generally only applied to research in the research councils sector, and whilst there has been some shift towards politically determined programmes in selected areas the principle of academics deciding on the award of funds still holds. This principle need not be altered dramatically to achieve a rebalancing of research between regions as much of the emphasis needs to be placed on creating new centres and facilities outside of the research council remit. Within the university sector there remains scope for some capacity building investments, even within a continued system of blind refereeing by academic peers. Scotland's science strategy co-exists with the national policy through the research councils, and similar initiatives operate in other countries where regions have a stronger role in infrastructure, but where national science policies still operate on a non-political basis.

Inevitably there will be much debate about these issues, and even within the Regional Studies Association there may not be a consensus on these points. However, we believe there are principles here that have not really been challenged by any evidence that the current policy is best for the UK as a whole, and that it would be beneficial to the country if that debate was made more public.

Reference

1. Development Plan 2008–2013, Regional Studies Association, 2008, Seaford, *"Governance, Science Policy and Regions"*, Regional Studies, Volume 41, Number 8, November 2007.

January 2009

Memorandum 36

Submission from the Biosciences Federation (BSF)

Introduction

The Biosciences Federation (BSF) is a single authority representing the UK's biological expertise, providing independent opinion to inform public policy and promoting the advancement of the biosciences. The Federation was established in 2002, and is actively working to influence policy and strategy in biology-based research—including funding and the interface with other disciplines—and in school and university teaching. It is also concerned about the translation of research into benefits for society, and about the impact of legislation and regulations on the ability of those working in teaching and research to deliver effectively. The Federation brings together the strengths of 45 member organisations (plus nine associate members), including the Institute of Biology which represents 39 additional affiliated societies (see Appendix). This represents a cumulative membership of over 65,000 individuals, covering the full spectrum of biosciences from physiology and neuroscience, biochemistry and microbiology, to ecology, taxonomy and environmental science. The Biosciences Federation is a registered charity (no. 1103894).

1. *Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science*

i. The Biosciences Federation welcomes the creation of the Cabinet Sub-Committee on Science and Innovation, which was long overdue, and urges the Cabinet Office to ensure that the Secretary of State for Culture, Media and Sport is represented on this Committee in the future. It is too early to say how effective the Committee will be in ensuring integration across government departments.

ii. The Council for Science and Technology has produced some excellent reports in recent years. However, the mechanisms used to identify both future studies and the individuals/organisations from whom evidence should be gathered, remain unclear. The website needs a radical overhaul to allow sufficient engagement with stakeholders.

iii. The Biosciences Federation believes that creating a Department of Science is currently unnecessary and risks orphaning science, rather than integrating it across government departments. Focus should be given to ensuring that science is fully embedded in relevant departments, and that these departments have the capacity within them to put science at the heart of policy-making.

2. *How Government formulates science and engineering policy (strengths and weaknesses of the current system)*

iv. The installation of departmental Chief Scientific Advisers has seen a major improvement in the quality of scientific input into the decision-making process. However, we urge the Chief Scientific Adviser's Committee (CSAC) to be more transparent in its workings and outputs. We also strongly support continued detailed evaluation of departmental policy procedures under the Government Office for Science's Science Review Programme but wish to see more visible outcomes.

v. Good policy making depends on a strong scientific culture within Departments. Departments must ensure that they employ well-qualified scientific staff, and that these staff maintain and extend their competencies and their awareness of current scientific issues. We are not confident that any departments are fully developing capacity in this area. Anecdotal evidence suggests that examinations for entrance into the Civil Service Fast-Track Scheme put more value on economic knowledge and drafting ability than scientific literacy.

vi. The Biosciences Federation warmly welcomed the 2007 update to the Code of Practice for Scientific Advisory Committees, particularly the recommendation that Scientific Advisory Committees should aim to hold regular meetings in open session. The Food Standards Agency has given an exemplary lead in opening its proceedings to scrutiny.

vii. In its response to the former Science & Technology Select Committee's report on *"Scientific Advice, Risk and Evidence Based Policy Making"*, the Government claimed to directly seek advice from Learned Societies. We see little evidence of this which suggests that expertise is not drawn from a sufficiently wide "pool".

viii. The Biosciences Federation is concerned about skills shortages in specialist scientific areas and research funding for basic research. Government must strengthen its links with sector skills organisations such as SEMTA and recognise that much good and fundamental research does not drive economic growth in the immediate term. A long-term view is needed to develop the evidence and capacity that is vital to the formulation of sound policy-making.

4. *The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating*

ix. The Haldane principle remains sound and does not need updating, but rather adhering to! The principle still allows Government to ring-fence some monies for strategic overarching priorities, but scientists must be free to direct the detailed research agenda. This is essential both for the protection of vulnerable areas of research and to allow the development on new research fronts, particularly in areas of basic research which may not be immediately applicable to the formulation of public policy.

x. The Biosciences Federation believes that there must be an overarching national science policy which is delivered on a regional basis in order to use local strengths to meet local needs. Regional science will also be important in reinforcing national policy. Our concerns over scientific literacy within the Civil Service also apply to the Regional Development Agencies (RDAs).

5. *Engaging the public and increasing public confidence in science and engineering policy*

xi. The current consultation procedures are largely passive in nature and do not actively engage the public in the decision-making process. Mechanisms of engagement should be implemented to ensure that public opinion is proactively sought, for example by making more use of citizen's juries. However public opinion alone must not be used to determine Government policy. The role of public engagement in policy making is discussed further in the BSF response to the DIUS consultation on "*A Vision for Science and Society*".[146]

xii. The recent RCUK/DIUS report *"Public Attitudes to Science"* found that the public subscribe to the "Haldane Principle", showing a preference for scientists and their professional bodies, rather than Government, to regulate science and engineering.

3 & 7. *Whether the views of the science and engineering community are, or should be, central to the formulation of government policy; how government science and engineering policy should be scrutinized and how the success of any consultation is assessed*

xiii. It is the knowledge of the scientific community, rather than its views, that should be used to inform government policy decisions. We are not confident that government departments build up their contact base sufficiently to allow them to draw on a broad pool of expertise. The importance of Learned Societies to science and engineering policy formulation should be better recognised by Government. Our organisations offer a wealth of expertise, through our members, who work at the forefront of research and innovation. Learned societies are well placed to deliver impartial, non-partisan, advice to Government based on the best available scientific evidence.

xiv. The former Science & Technology Select Committee was well placed to scrutinise science-based policy across all Government departments. Its new siting risks that the Committee's recommendations will only apply within DIUS. The Government Office for Science must strengthen its role in scrutinising science policy with more visible outcomes.

xv. Although the evidence gathering process is clear, it is not often clear how this evidence has been used in policy formulation. For example, the analysis of the 2007 consultation from the FSA on the options to increase folate intake in young women was conducted in "tick box" manner and so nuanced positions were lost. Government departments and agencies should look to the Environment Agency as a model of good practice where detailed responses, showing how and why evidence has been incorporated or rejected, are routinely provided.

xvi. Where new evidence has a radical impact on existing bodies of evidence, it is essential that this evidence is shared with, and replication sought by, experts in the relevant knowledge base. Changes in policy should only occur after thorough consideration of all the evidence and a detailed risk assessment.

Taskforce Members

This response was written by a BSF Task Force comprising Dr S Ahmed (Institute of Biology), Dr E Bell (Physiological Society), Dr F Bhatti (Royal Society of Chemistry), Dr R Dyer (Biosciences Federation; Chair), Dr L Fielding (Society for Applied Microbiology), Dr C Kirk (Biochemical Society), Dr B Knowles (Institute of Biology), Ms C Margerison (British Ecological Society), Dr R Prince (British Pharmacological Society), Dr E Thomson (Royal Society of Chemistry), Dr C Wallace (Biosciences Federation) and Dr J Wilbraham (AstraZeneca).

January 2009

[146] Available at http://www.bsf.ac.uk/responses/ScienceAndSocietyOct08.pdf

APPENDIX

MEMBER SOCIETIES OF THE BIOSCIENCES FEDERATION

Association for the Study of Animal Behaviour
Association of the British Pharmaceutical Industry
AstraZeneca
Biochemical Society
Bioscience Network
British Andrology Society
British Association for Psychopharmacology
British Biophysical Society
British Ecological Society
British Lichen Society
British Mycological Society
British Neuroscience Association
British Pharmacological Society
British Phycological Society
British Society of Animal Science
British Society for Developmental Biology
British Society for Immunology
British Society for Matrix Biology
British Society for Medical Mycology
British Society for Neuroendocrinology
British Society for Plant Pathology
British Society for Proteome Research
British Toxicology Society
Experimental Psychology Society
Genetics Society
Heads of University Biological Sciences
Heads of University Centres for Biomedical Science
Institute of Animal Technology
Institute of Biology
Institute of Horticulture
Laboratory Animal Science Association
Linnean Society
Nutrition Society
Physiological Society
Royal Microscopical Society
Royal Society of Chemistry
Society for Applied Microbiology
Society for Endocrinology
Society for Experimental Biology
Society for General Microbiology
Society for Reproduction and Fertility
Syngenta
Universities Bioscience Managers Association
UK Environmental Mutagen Society
Zoological Society of London

Associate Member Societies

Association of Medical Research Charities
BioIndustry Association
Biotechnology & Biological Sciences Research Council
GlaxoSmithKline
Merck, Sharp & Dohme
Pfizer
Royal Society
Wellcome Trust
Medical Research Council

Additional Societies represented by the Institute of Biology

Anatomical Society of Great Britain & Ireland
Association for Radiation Research
Association of Applied Biologists
Association of Clinical Embryologists
Association of Clinical Microbiologists
Association of Veterinary Teachers and Research Workers
British Association for Cancer Research
British Association for Lung Research
British Association for Tissue Banking
British Crop Production Council
British Inflammation Research Association
British Marine Life Study Society
British Microcirculation Society
British Society for Ecological Medicine
British Society for Research on Ageing
British Society of Soil Science
Fisheries Society of the British Isles
Freshwater Biological Association
Galton Institute
Institute of Trichologists
International Association for Plant Tissue Culture & Biotechnology
International Biodeterioration and Biodegradation Society
International Biometric Society
International Society for Applied Ethology
Marine Biological Association of the UK
Primate Society of Great Britain
PSI—Statisticians in the Pharmaceutical Industry
Royal Entomological Society
Royal Zoological Society of Scotland
Scottish Association for Marine Science
Society for Anaerobic Microbiology
Society for Low Temperature Biology
Society for the Study of Human Biology
Society of Academic & Research Surgery
Society of Cosmetic Scientists
Society of Pharmaceutical Medicine
Universities Federation for Animal Welfare

Additional Societies represented by the Linnean Society

Botanical Society of the British Isles

Systematics Association

Memorandum 37

Submission from the UK Resource Centre for Women in Science, Engineering and Technology (SET)

1. Introduction and Summary

About the UKRC

The UK Resource Centre for Women in Science, Engineering and Technology (SET) works to significantly improve the participation and position of women in science, engineering and technology occupations in industry, research, academia, and public service to benefit the future productivity of the UK and the lifetime earnings and career aspirations of women. It is the UK's leading centre providing information and advisory services to employers and organisations in the SET sectors and supporting women entering, returning and progressing in these fields.

Summary

1. Detailed arguments and proposals are contained in the main body of the submission.

2. A separate science or SET department in itself would not help gender equality and thereby improve science policy. It could diminish progress across similar and equally occupationally segregated industries and jobs, by creating silos.

3. Current policy formulation of science is inherently weak as decision making bodies are not gender/diversity balanced. UKRC disagrees with the proposals from the government to drop the PSA target for women to be 40% of SET boards. Policy would also be improved through smarter strategy which joins up policies in different domains and machinery and champions to ensure that gender objectives and targets are set and achieved.

4. Successful consultations attract a high number of quality responses from diverse groups. But in addition, from the point of view of the UKRC and its stakeholders, success subsequently depends on how well gender or gender based concerns are clearly embedded into the policy being consulted on.

5. UKRC believes that engaging more women in science is essential, and it could form a virtuous circle, assisting with the take up of STEM education and employment opportunities. Better representation of women at all levels of engagement, decision making and delivery would help shape and influence policy for the better, as would a focus on women's concerns and interests, and the use of a "gender lens". This submission includes many suggestions.

6. We propose that UKRC has a more central role in the analysis, monitoring and gender impact assessment of science/SET policy at an early stage of development.

7. We propose that UKRC has a role in scrutiny, regarding any gender implications of science/SET policy.

2. Structures to put Science at the Heart of Policy Making

IUSS asks:

2.1 Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science.

UKRC response on departmental arrangements

2.2 Our interest is in the way science and science policy, and policy generally can be improved as measured by the increased participation of women in science and science decision making. We argue that a separate department will not in itself create progress. It could even create silos between related areas of occupational segregation.

2.3 It is imperative that the conditions in the UK are right for women's full contribution to SET because we need a "representative and well qualified scientific workforce". We believe the formation of a Department for Science in itself will not be sufficient to put gender at the heart of science. To do this, requires understanding, a measured plan, and senior civil servants having the will to make progress, with support from expert agencies like the UK Resource Centre for Women in SET.

2.4 A separate science department could potentially be a silo in relation to other sectors that are equally gender segregated (eg ICT, construction) and limit progress on all fronts. Gains made in these and other sectors are often transferable and companies cut across sector boundaries. Such problems were the case with the old DTI/OST structure. By contrast with DIUS now, we are seeing more joined up thinking about education and employment pathways, and a greater understanding of occupational and vertical segregation and the position of SET within this.

3. The Formulation of Science and Engineering Policy

IUSS asks:

3.1 About how Government formulates science and engineering policy—the strengths and weaknesses of the current system.

UKRC response on the formulation of science and engineering policy

3.2 UKRC argues that science and engineering policy formulation would be improved by:

- More women in science and engineering decision making
- Smarter strategy which joins up policies in different domains
- Machinery and champions to ensure that gender objectives and targets are set and achieved:
- Facilitate an integrated, cross departmental approach to women and SET across all of the relevant policy areas
- Institute an integrated strategy on women in SET on the whole "leaky pipeline" of supply
- Charge the Minister for Science and Innovation with being the "Women and SET Champion" within Government, working with the Ministers for Women on occupational segregation, discrimination and the impact of caring responsibilities.[147]
- Reinforce the strategic importance of women in the supply of talented scientists and engineers at every formal opportunity in policy.

3.3 It is our view that effective action to address women's disadvantage in SET and put gender on the agenda requires complex, cross cutting analyses and responses. SET is notoriously male dominated especially at senior and decision-making levels. Policy making at the higher levels also lacks an integrated gender perspective. This leaves the "gender questions" unasked.

3.4 Gender analysis and relevant solutions are rarely included in higher level "mainstream" reports like Leitch and the STEM initiatives. Another opportunity was Race to the Top which could helped mesh policy on skills and the under representation of women in SET. Initiatives within science policy need to join up with for example, the Women and Work Commission, SET Fair (2002) and UKRC's expert advice.

3.5 A key weakness is the lack of women on science and engineering decision making bodies. More equitable representation would help with excellence and with shaping priorities. The government should retain the 40% target for women on SET bodies.

3.6 UKRC contends that "smarter" strategy on science, policy more widely and gender equality would:

- Join up the policy domains of gender equality, gender in SET, with those of science and innovation, skills and employment.
- Formulate policies with clearer, more explicit gender equality and diversity objectives, with targets where relevant.

3.8 The Science and Innovation Minister acting as the Women and SET champion should lead this, linking with the UKRC as the lead delivery body, well placed to advise on policy impact as well as good practice. The expert group on women in SET can also advise.

3.9 We also recommend a cross departmental body with a brief to ensure an equality framework within all the relevant SET policy fields. Diversity and women's diversity should be addressed through action to increase, for example, black and minority ethnic people's representation in SET. The key contractor for women in SET, the UKRC for Women in SET can advise this body.

4. Taking Account of the Views of the Science and Engineering Community

[147] UKRC argues that gender needs to be addressed as a distinct area of "diversity" and not subsumed into a vague and therefore ineffective "generic" approach to equality and diversity.

IUSS asks

4.1 Whether the views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is assessed.

UKRC response on involving the community and consultation success

4.2 Consultations need to attract a good number of high quality responses, from diverse groups. We also recommend that:

- Those concerned with the under representation of women in SET, should be involved in consultations
- Higher level policies should signal important issues concerning inequality, gender and under representation,
- Success will involve proper consideration and reflection of issues in final policy
- Success for UKRC would be:
- Explicit statements about addressing women's equality and representation (going further than passing references to under representation or diversity)
- Effective machinery, champions and action to improve women's involvement in science
- Requirements for disaggregated statistics and monitoring
- Discourse/language demonstrating an understanding of gender (power) relations and the gendering of society
- Targets to assist with increasing the numbers of women (or men) in specific areas
- Commitments to positive action
- Commitments to flexible working and approaches for equal opportunities
- Provisions for "culture change" in science and science policy
- Support for the work of the UKRC
- Recommendations for "integrated strategies" with focus on all aspects of supply, demand, retention and progression of women in SET (ie we can't just focus on girls/schools/university).

4.3 However, it is still rare for mainstream policy to clearly acknowledge and address women's under representation in science and engineering. It is rare even that diversity or inequality generally is mentioned. Signaling equality and issues of under representation at higher levels supports and guides commitment at implementation level.

4.4 The UKRC is an organisational member of the science and engineering community. It works with employers in the sector, universities and colleges, intermediary organisations and individual women scientists and engineers. The UKRC makes regular submissions to departmental consultations and select committees. It also reports on its own work and service delivery and collates or commissions research into the under representation of women in SET. The formal responses encompass a wide range of policy areas—education, employment and skills, equality, as well as science and education.

4.5 The UKRC can see the linkages between these policy areas and assist with integrated policy development. The following case study uses a recent consultation.

Case study

4.6 During the development of the Vision for Science and Society (DIUS lead), with encouragement from DIUS, UKRC conducted a very successful (secondary) consultation to enable the voice of more than 200 stakeholders concerned with women in SET. The report[148] can be found on our website: www.ukrc4setwomen.org

4.7 The UKRC gathered a great deal of opinion and evidence from this exercise. There were many practical suggestions concerning excitement and valuing science, confidence in the use of science and a well qualified and representative work force.

4.8 The suggestions about the workforce resonated with recommendations from SET Fair (2002) and to a very great extent confirmed our strategy.

4.9 The consultation implied that the government wished to be informed and guided about a vision for science in society and practical steps. It was in this spirit that we all engaged.

[148] UK Resource Centre for Women in Science, Engineering and Technology Response to the Consultation on the vision for science and society.

4.10 For the UKRC, success would be a vision that encompassed active efforts to:

— Address problems and issues in relation to gender imbalance and women's representation (on engagement, confidence, involvement, education, employment and media.

— Include recommendations which reflect the advice and findings of our consultation submission

4.11 In conclusion, we draw attention to the online survey element of the consultation. Respondents focused on the SET work place. Too many painted a sorry picture of work in higher education, in academic research and in industry. This is not news to UKRC, but of great concern. This is why a strong steer in the forthcoming vision focusing on the under representation of women in SET and positive action to address it would indicate a "successful" consultation to us, and we believe most of the individual women (and men) who contributed.

5. Engaging the public and increasing public confidence in science and engineering policy

IUSS asks:

5.1 How can we engage the public and increase public confidence in science and engineering policy.

UKRC response to issue of engagement and confidence in science and engineering policy

5.2.1 UKRC argues there is no single solution to women's increased confidence and engagement in science and scientific policy. We need measures to address several inter related factors concerning women's:

— wider participation in democracy and in dialogue about science

— representation and visibility in the science workforce at all levels and roles

— representation in policy fields

— needs and interests being reflected in scientific practice and policy priorities, and in government and policy generally

— equal representation in the leadership and governance of science.

5.2.2 UKRC also argues that improvements across these domains:

— require a commitment and good practice on gender equality

— would be accelerated by full implementation of the Gender Equality Duty

— would be aided by systematic positive action initiatives nationally to increase the number of women in the SET workforce, including targeting and outreach.

5.2.3 UKRC consultation participants called for these gender related changes to improve science and science policy:

— Engagement of women and men equally with science issues and policies

— Scientists to share knowledge and not protect their status. Scientists need also to explain to other professionals

— Inclusiveness and balance in the viewpoints which define science priorities

— Fairness in the distribution of impacts and benefits of science and technology policies for men and women

— Conscious consideration of possible areas of unfairness to women or men (in government and public sector policy, business practice, education policy and related areas)

— The promotion and involvement of more women to positions of leadership and policy formation

— Fixed quotas on all public committees[149]

— Gender Audits of all new science policy for equity and transparency

— A science communication policy that reaches and represents women as well as men

— Stronger guidelines for press and media reporting on controversial science issues. A kitemark for good reporting.

—

5.2.4 UKRC consultation participants also offered large number of suggestions to increase confidence and engagement amongst women as citizens. Targeting was an essential feature:

— More consultation and discussion through organisations like UKRC

— Take science out of the laboratory, boardroom or committee

— Meet with women on their own terms

— Selective and targeted use of media and new media (including popular media) to ensure all women are reached

[149] There are distinctions to be made between quotas and targets. The UKRC tends to recommend targets.

— Promotion of role models eg women scientists better represented in the media

— Target women in science fields who don't see themselves as scientists (eg health professionals)

— Use women's non SET networking sites and women's organisations

— Outreach activities with adult women, including mothers

— Businesses to engage more in outreach activities

— Use specialist women in SET networks and groups

— Support for organisations such as UKRC that reach and work with women

— University groups

— Pensioner groups

— Debating forums in every city

— Engage with the voluntary sector

— Orchestrate events where women are likely to come on their own

— Demonstrate the relevance and utility of science in addressing concerns often held by women

— Disseminate female oriented research

— Undertake more research that redresses gender bias/neglect

— Influence the professional bodies engaged in SET

— Public national campaigns via TV to raise awareness of what individuals can do to make a difference

— More direct engagement with communities

5.2.5 Media and communication in increasing engagement and confidence:

— Science communication—women scientists should play an appropriate role that enhances their standing as scientists, raises the profile of women scientists and women's interests in science, and improves the standards of communication.

— Media—representation—women as scientists need to be better represented in the media and representations of women scientists should never be gender stereotyped or sexist.

Additional background to the recommendations

5.3 UKRC believes that making science more clearly relevant to women as a diverse but identifiable group would increase engagement overall. This is right for society and right for women's equality. Some science issues have an obvious gender dimension but not all do. However whether women have a gender based interest or not—women's views, needs and concerns as 50% of the population, are always relevant. We also believe that engaging more women would also assist with the take up of science or STEM education and employment opportunities, forming a virtuous circle.

5.4 Relevance, confidence, understanding and "scientific literacy" are all essential elements. Each must be approached with a willingness to explore a wide variety of gender dimensions, which are sometimes "concealed" from us.

5.5 If women and girls form a greater proportion of the "disaffected", the disinterested and the scared as they are said to do, then government, business and the voluntary sector should be targeting them to increase their understanding, their confidence and their engagement.[150] This is a good example of the need for positive action (through targeting and outreach for example).

[150] Reference here to remarks made by Jim Al-Khalili, Prof. of Physics and of Public Engagement in Science, University of Surrey, at UKRC event at Liverpool BA Festival 2008.

6. The Role of Stakeholder Organisations

IUSS asks

6.1 About the role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy.

UKRC response to questions about the role of various organisations in science and engineering policy.

6.2 We propose that UKRC has a more central role in the analysis, gender impact assessment and monitoring of science policy at an early stage.

6.3 The UKRC like many other intermediary and influencing organisations can bring its particular expertise, perspective and constituency in relation to women's participation and progression in science and engineering.

6.4 The UKRC is well placed to engage women and men in thinking about science and science policy. Through the vision consultation for example, we have found an appetite. Our links with a wide range of stakeholders, including women in SET organisations and women's organisations whose remit is not primarily science related, should be tapped.

7. The Scrutiny of Government Science and Engineering Policy

IUSS asks

7.1 IUSS asks how government science and engineering policy should be scrutinized.

UKRC response on scrutiny

7.2 We propose that UKRC has a role in scrutiny regarding any gender implications of science policy.

7.3 Women need to be properly represented in scrutiny. Men and women involved in scrutiny should raise a "gender lens". The presence of indicators, targets, disaggregated statistic, gender equality action schemes, positive action relating to women should be high on the agenda of the scrutineers. Gender equality experts from the UKRC and other organisations can support the machinery of scrutiny.

The following two brief case studies illustrate how a gender lens in scrutiny reveals ways to improve policy.

Case Study 1

7.4 Scrutiny of UK innovation policy reveals reveals an absence of analysis about its gender dimensions.

7.4.1 Under explored in thinking about innovation are the links between innovation, research and development (R and D) and the involvement of women (and other under-represented groups). Some interesting research from Germany suggests that companies need to examine their R and D departments for their effectiveness Schraudner (2006).
"The intensive interaction with partners in the marketplace, research institutions and customers increases the efficiency and effectiveness of innovation performance."[151]

7.4.2 This research suggests a number of ways gender is relevant in the R and D process:

new objectives for technological developments

the context for a new product or service during development

adaptations of existing products or services for new uses.

7.4.3 One aspect of their analysis showed how different specific products and services took account of gender to different degrees throughout the innovation cycle. This led to differing success:

> Voice recognition systems needed to take account of higher voices and user tests had been done *without* women; new skis were developed *with* women in mind and in the process; a care robot needed to be developed for the *different* care needs (personal hygiene or cleaning) requested by women and men; in the exploration phase, *attention was not paid* to women's symptoms in heart attack, leading to a lower chance of survival; water pumps were unsuccessful where design *did not take account* of culturally unacceptable behaviour for women.

[151] Schraudner, M. (2006) *Gender Aspects in Research*—A Fraunhofer-Gesellschaft Project sponsored by the German Federal Ministry of Research and Technology (Presentation to 13th Meeting of the Helsinki Group, Brussels, January 2006)

7.4.4 If women aren't involved in R and D in sufficient numbers and positions of leadership, if women as customers with specific gendered needs are invisible because gender is not disaggregated, if women are not progressing through our universities into research and other positions of leadership in industry, it is very likely that we will lose opportunities for innovation across all its phases and in terms of all stakeholders.

7.4.5 The German work included a programme of intervention to develop greater gender sensitization in innovation that merits further consideration in case it is transferable here.

Case Study 2

7.5 *Race to the Top*

7.5.1 We take Chapter 4 on Knowledge Transfer from *Race to the Top* and demonstrate how a gender lens can indicate additional or modified policy and practice recommendations.

7.5.2 Opportunities to move into industry are as important to women and men working in SET. A number of the recommendations of this chapter could have been enhanced by a gender focus to ensure that women are getting appropriate access to schemes and programmes. A case could be made for positive action where women have been under represented.

Rec 4.2 (page 60) Senior Industrial Professionals should be aware of and charged with taking positive action in respect of industry facing activities

Rec 4.3 (page 60) The competition which allocates HEIF4 funding should have gender criteria

Research Councils who are already engaged in the equality and diversity agenda could be incentivised in relation to gender (page 61)

Initiatives with SMEs and NfP organisations present an ideal opportunity to maximise women's participation (page 61)

Rec 4.5 (page 63–4) The expansion of the KTPs should build in gender and diversity related requirements. What is the gender disaggregated breakdown of placements over the past few years? Analysis could show if women are under-represented in partnerships and, if so, it would be possible to design positive action to increase the interest and success of women. However, without the figures we do not know if there is a problem. UKRC has some evidence that women are not entering UK SET entrepreneurship so readily.

The mini KTP programme and the developments in FE should be gender proofed and the Gender Equality Duty's guidance applied.

The PSRE Fund's impact and development should also be looked at from a gender perspective: as a start, gender disaggregation of the data around leadership/ownership and participation in projects, spin outs etc. Beneficiaries of the fund should be able to demonstrate that they have gender proofed their work, along the lines of the German innovation initiative (in case study 1 above).

January 2009

Memorandum 38

Submission from the Academy of Medical Sciences

SUMMARY

1. The Academy of Medical Sciences welcomes the opportunity to respond to the House of Commons Innovation, Universities, Science and Skills Committee inquiry "*Putting science and engineering at the heart of government policy*". The Academy's core mission is to promote advances in medical science and to ensure these are translated as quickly as possible into benefits for society. Our 912 Fellows represent the UK's best medical researchers, drawn from hospitals, universities, industry and the public sector. The Fellows are therefore key elements in connecting science, government, policy and society. Given the Academy's constituency, our response focuses on medical research. We would be pleased to expand on any of the points made in this submission.

2. From the discussion below, we emphasise the need to:

— Integrate science into government policy-making through embedding researchers in policy teams, seconding scientists into government and providing senior civil servants with scientific training.

— Harness the resources offered by the national academies.

— Use scientific approaches to assess the success of policy interventions.

— Provide guidance to outside agencies on the various structures within government that consider scientific evidence and advice.

— Improve transparency around the teams responsible for specific policy areas.

— Engage scientists at the earliest stages of policy development.
— Defend the Haldane principle.
— Support younger scientists and clinicians—particularly GPs—in public engagement activities.
— Develop a dedicated online strategy for science and society.

3. This submission includes sections on:
— Government policy involving science.
— Government policy about science.
— Public engagement.

Government Policy involving Science

4. The Academy has long been active in promoting the need for public policy-making to make use of the best available scientific evidence. It is almost impossible to think of a significant policy issue that does not require the use of scientific evidence. We therefore believe that the views of the science and engineering community should be central to the formulation of all government policy. Furthermore, we urge consultation with the scientific community at the earliest stages of policy development.

5. The first recommendation of our 2007 report "*Identifying the environmental causes of disease: how should we decide what to believe and when to take action?*"[152] calls on the government to integrate science into policy-making by:

— Embedding researchers into policy teams.
— Providing senior civil servants with scientific training.
— Seconding scientists into government.
— Building a cadre of "evidence-brokers" within government who are trained in both science and policy.

6. The report also emphasises the importance of a taking scientific approach to scrutinising the effectiveness of policy interventions: "*Government … should ensure that there is a greater emphasis on pilot studies and rigorous evaluations of the effects of [policy] interventions".*

7. The government has done a great deal to emphasise the role of science in policy-making in recent years, particularly through the establishment of departmental chief scientific advisers (CSAs), the Foresight programme and GO-Science. We particularly welcome the decision to upgrade the role of science minister to include attendance at Cabinet meetings and chairmanship of the new Cabinet Sub-Committee on Science & Innovation. However, there is still considerable variation between government departments in their use of science, something we emphasised in our responses to the departmental reviews conducted by the former Office for Science & Innovation. It is vital that Parliament, particularly through the House of Commons Committee on Innovation, Universities, Science and Skills and the House of Lords Science and Technology Committee, scrutinises the use of science by government departments, and reviews the performance of the various governmental scientific advisory bodies and structures.

8. There are numerous structures in government charged with considering scientific advice and evidence: we counted seven government-wide science groups, in addition to the various Science Advisory Councils and the 75 Science Advisory Committees. This can be daunting for outside agencies to navigate, and a centralised resource that lists all relevant groups and committees (and their constituent members and contact details) would be beneficial. The Council for Science & Technology (CST), which reports directly to the Prime Minister, is an important structure for ensuring that scientists can engage with government at the highest levels. CST has published several influential reports in recent years, but there is potential for it to do more, particularly in engaging the wider scientific community in identifying priority issues to raise with Ministers.

9. Accessing specific policy-makers within government can be difficult and haphazard. There is a feeling amongst Academy Fellows that government departments are still too insular and compartmentalised, and could do much more to engage with the wider scientific community to access new research findings and consult with experts. For example, government policy-makers would benefit from a more visible presence at relevant scientific and science policy symposia, and should avoid simply delivering a presentation without hearing about wider developments and engaging in debate. There is also scope for increased transparency around the departmental teams who are responsible for particular policy areas; e-mail addresses and telephone numbers are difficult to find and it is often impossible to identify the right individual to contact, even for initial inquiries.

10. Government policymakers and Parliamentarians have stressed the value of the medical science community speaking with "one voice" on important issues, and over the years the Academy has formed effective collaborations with our peer organisations (Association of Medical Research Charities, Medical Research Council, Wellcome Trust, Royal Society, Cancer Research UK etc.) on debates including the

[152] A full copy of the report can be downloaded from http://www.acmedsci.ac.uk/p99puid115.html

Human Tissue Bill, the Mental Capacity Bill, the Human Fertilisation and Embryology Bill, the EU Clinical Trials Directive and other legislation. We have also recently initiated a cross-Academy policy group, including representation from the Royal Society, British Academy and Royal Academy of Engineering. In this way, we hope that policymakers can assess the *weight*, as well as the breadth, of scientific opinion around particular policy options; a crucial component of any successful consultation.

11. The recent Human Fertilisation & Embryology (HFE) Bill/Act provided a good case study for the use of science in government policy-making. Whilst government could have engaged scientists more fully at the very earliest stages of policy development (particularly in the development of the initial Command Paper), subsequent dialogue with the scientific, medical and patient communities was very constructive. Credit should be given to the expertise and diligence of officials in the Bill Team within the Department of Health, as well as to the scientists who provided evidence and advice. The HFE Act also showcased how the Academy of Medical Sciences can provide expert, authoritative input into policy debates: after publication of our initial report *"Inter-species embryos"*[153] we worked with colleagues in the Medical Research Council (MRC) and Wellcome Trust to produce ten separate written briefings and three Parliamentary seminars, as well as numerous e-mails, telephone conversations and meetings with individual MPs, Peers, government officials and media representatives.

12. From our particular perspective, we believe government could make much more use of the Academy of Medical Sciences, as well as other national academies and Learned Societies, which provide expert, and most importantly *independent*, advice and input. This point was emphasised in the 2007 CST report "*How academia and government can work together"*: "*CST also believes that Government should make greater use of bodies such as the Learned Societies, Research Councils and the independent bodies such as the CST, all of which have strong academic links and provide another valuable source of external academic capacity.*"[154]

13. The Fellows of the Academy are an expert national resource—representing the breadth of basic and clinical medical research—on which policymakers in government and allied agencies can draw. The Academy responds to specific requests for input from government and others, and makes submissions to governmental, Parliamentary and other public consultations. We also have a strong proactive mission to raise important and timely policy issues, to horizon-scan future topics, to promote debate, to challenge existing policies and to identify future opportunities for UK health and medical science. Through our reports, such as "*Pandemic influenza"*[155] and "*Systems biology"*,[156] the Academy provides authoritative, evidence-based analysis and recommendations for action. We also invest considerable time and effort into follow-up work, ensuring that our reports, for instance on the use of patient data in research[157] or on non-human primates,[158] really do catalyse action in government and beyond.

14. We emphasise that the Academy's policy and other activities are resource intensive and require ongoing support from government (amongst other funders). The Academy of Medical Sciences currently receives a small grant-in-aid from the Department of Health, which will provide £415,000 in 2009–10; £425,000 in 2010–11; £435,00 in 2011–12; and £450,000 in 2012–13. Despite requests, the Academy receives no financial support from the Department for Innovation, Universities and Skills (DIUS). This situation contrasts starkly with the other national academies, which all receive Parliamentary grants-in-aid from DIUS (see table below). In the 10 years since the Academy of Medical Sciences' inception, we have accomplished a great deal with only modest resources. However, securing financial support from DIUS would provide the opportunity for us to reach our full potential.

	Royal Society	*British Academy*	*Royal Academy of Engineering*	*Academy of Medical Sciences*
DIUS Parliamentary grant-in-aid 2007–08	£44.9 million	£21.3 million	£9.8 million	£0

Government Policy about Science

15. The Academy firmly believes that science in general, and medical research in particular, brings significant social and economic benefits. Indeed, a recent report commissioned by the Academy, MRC and Wellcome Trust estimates that the socio-economic benefits from public and charitable investment in medical research are very substantial.[159] A thriving science base contributes to UK prosperity, promotes the health and well-being of our citizens and prepares us for future national and international challenges. Establishing a UK economy that is built on knowledge and innovation is the only way to address growing global economic and industrial competition, particularly from China, India and South Korea. While it is

[153] To access the report go to: http://www.acmedsci.ac.uk/p99puid105.html
[154] CST (2007). *How academia and government can work together.* http://www.dius.gov.uk/policy/documents/academia_gov_work_together_131008.pdf
[155] To access the report go to: http://www.acmedsci.ac.uk/p99puid89.html
[156] To access the report go to: http://www.acmedsci.ac.uk/p99puid97.html
[157] To access the report go to: http://www.acmedsci.ac.uk/p99puid62.html
[158] To access the report go to: http://www.acmedsci.ac.uk/p99puid83.html
[159] For more information see: http://www.wellcome.ac.uk/News/Media-office/Press-releases/2007/WTX038680.htm

appropriate for one government department to lead on science (and disappointing that the UK government currently lacks a department with "science" explicitly in its title), we emphasise that full utilisation of science and research should pervade all departments.

16. From the medical science perspective, the UK's current research environment is strong, especially following the establishment of the National Institute for Health Research (NIHR) and the Office for the Strategic Coordination of Health Research (OSCHR). The recent emphasis on quality and innovation in Lord Darzi's NHS Next Stage Review also puts science at the forefront of the health service: the proposed Health Education and Innovation Clusters (HEICs) and Academic Health Science Centres will provide opportunities to establish regional policies around health science which both harness regional expertise and address local needs.

17. While such support for medical science is to be commended, we emphasise that OSCHR, NIHR and MRC (and indeed all research councils and science funders) must defend the Haldane principle to protect the independence of the research agenda from short-term political pressures. The balance of funding for different research areas will vary over time and should be influenced by societal need and determined by scientific opportunity—creative ideas, talented researchers, and advances in technology. We stress the need for continued basic research to fuel the pipeline for translational exploitation.

Public engagement and dialogue

18. Methods of public dialogue have advanced considerably over the years and the DIUS Sciencewise-ERC programme and others have done much to establish and disseminate good practice. Policy development in important areas such as GM technology or embryo research could not now be contemplated without integrated public dialogue.

19. We emphasise that there is no "them and us" when it comes to scientists and the public: scientists are themselves part of society. This was demonstrated during the Academy's recent study into "*Brain science, addiction and drugs*", in which participants in the public meetings and workshops raised the same concerns, voiced the same hopes, and identified the same challenges and opportunities as the experts.[160] Nevertheless, the report emphasised that: "*in a liberal democracy, an intelligent and appropriate approach to the regulation of recreational drug use presupposes a prior deliberative and inclusive community debate … Government should therefore continue to engage in a sustained conversation with the public to develop a position that commands real support*". This point can be generalised to many other areas of public policy.

20. There is now an expectation upon top scientists that they will take their work into public forums. The Fellows of the Academy typify this new breed of scientist: of the 215 Fellows who responded to our 2007 communications survey, 98% had engaged with the media about their work and 83% had given a public lecture.[161] Reward and recognition of scientists who take on science communication as part of their work are important, and national academies, including our own, have a role to play in acknowledging excellence in this sphere. Research funders and higher education institutions routinely include expectations around public engagement in grant application forms and job specifications. However, there is still scope for recognition of public engagement work in future versions of the Research Assessment Exercise.

21. It does appear that participation in public engagement work is more common amongst senior scientists, perhaps because they have reached a level where they have more control over their time. It is important to ensure that researchers at all stages of the career pathway are encouraged to participate in public engagement activities, particular younger researchers who might be better able to connect with children and teenagers. There is a case for a specific, dedicated grants scheme to enable early-career researchers to undertake public engagement work. It would also be helpful to gather information about the experiences of younger scientists who combine flourishing research careers with significant profiles as science communicators, and to gain the views of science festival coordinators and media representatives about what makes a good communicator and how scientists with a talent for public dialogue can be identified and nurtured.

22. We stress that many medical scientists are also practicing clinicians who engage with many different publics on a daily basis. This interaction is often not included in discussions about public engagement, yet is one of the most common and most important aspects of the public's involvement with science. GPs in particular could play a significant role in engaging individuals, families and communities in medical science, and will almost certainly have to respond to an increasing number of scientific inquiries from their internet-using patients. There was broad consensus that this issue merits further consideration at a recent Academy symposium on "*GPs and research*".[162]

23. Finally, given that the public are increasingly accessing scientific information from the internet, we believe that, to date, public engagement strategies have not taken sufficient account of the growth in online media. We therefore make a strong call for the development of a dedicated UK "online strategy for science".

[160] To access *Brain science, addiction and drugs* report, go to: http://www.acmedsci.ac.uk/p99puid126.html
[161] To access the Fellows Communications Survey, go to: http://www.acmedsci.ac.uk/p101puid124.html
[162] For further details see—http://www.acmedsci.ac.uk/p43evid102.html

This strategy should include evaluation of current and previous online initiatives: what has worked and what has not? Whilst technical advances encourage the use of ever more dynamic and interactive approaches, which tools are actually effective in generating public engagement around science?

The Academy of Medical Sciences

The Academy of Medical Sciences promotes advances in medical science and campaigns to ensure these are converted into healthcare benefits for society. Our Fellows are the UK's leading medical scientists from hospitals and general practice, academia, industry and the public service.

The Academy seeks to play a pivotal role in determining the future of medical science in the UK, and the benefits that society will enjoy in years to come. We champion the UK's strengths in medical science, promote careers and capacity building, encourage the implementation of new ideas and solutions—often through novel partnerships—and help to remove barriers to progress.

January 2009

Memorandum 39

Submission from the Science Council

The Science Council is a membership organisation for learned societies and professional bodies across science and its applications and it works with them to represent this sector to government and others. The Science Council promotes the profession of scientist through the Chartered Scientist designation and the development of codes of practice; it promotes awareness of the contribution of professional scientists to science and society and advances science education and increased understanding of the benefits of science. The Science Council provides a forum for discussion and exchange of views and works to foster collaboration between member organisations and the wider science, technology, engineering, mathematics and medical communities to enable inter-disciplinary contributions to science policy and the application of science.

In preparing this response we have consulted member bodies to identify areas of common interest and the issues they raised form the content of this memorandum. In addition a number of member bodies will be responding individually to the inquiry.

Consultation

It is noted that the title of the inquiry is *Putting Science and Engineering into the heart of Government Policy*. We have interpreted this as principally exploring how best government policy across all areas may be influenced by science and that engineering is intended to embrace technology and inform evidence as case studies. If engineering is not a case study, it was not clearly set out in the inquiry as to why this area of science has been identified individually. In addition to covering science policy more generally we have briefly addressed the questions asked by the Inquiry about science funding and support issues.

The Science Council's interests encompass both the core disciplines of science (physics, chemistry, biology and mathematics) and the application of science, including technology, engineering and medicine. The Science Council has recently agreed a definition of science as:

> *Science is the pursuit of knowledge and understanding of the natural and social world following a systematic methodology based on evidence.*

1. Question 1

Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science

1.1. In the 21st Century, science and technology are fundamental activities in all areas of society and in recognition of its importance the Government has made science and innovation a leading priority for the future. The Science Council embraces this view and believes that science as defined above has a place in all areas of government policy and across all government departments and activities, including local and regional government. There is therefore a need to embed high quality independent scientific advice across and within all sectors of government and government agencies.

1.2. In the past there has been a tendency to assume that a "separate" "scientific advice" function within a single department or committee can effectively carry influence across government departments: evidence suggests this is not the case and that sometimes departmental positions differ or are not fully compatible. There is no adjudication system when such differences of view occur which can lead to presentational and other difficulties. In addition, there is a need also for policy in government agencies and regional and local government to be informed and evidenced by science: for example in the areas of waste management and

recycling, power generation, transport, water safety and conservation, and sustainable cities. Innovation is needed to develop ways in which scientific information and advice is shared more widely: using and developing the Government Connect programme might be worth exploring further.

1.3. Government employs many scientists and engineers working in a variety of roles, not only as scientists and engineers. The Science Council would like to see the profile raised of scientists within Government, including those working within Government laboratories and suggests that scientists and engineers should be recognised more explicitly as a professional group within Whitehall and local government.

2. Question 2

How Government formulates science and engineering policy

2.1. The Science Council supports the appointment and role of Chief Scientific Advisers in all government departments and sees these as a very positive element within the overall structure of government scientific advice. We believe that there should be innovation and flexibility in the way each CSA functions within their own environment. It is equally as important that CSAs and their teams receive adequate support and have the resources to commission or undertake research necessary to supplement evidence or fill gaps in data to support the development of policy advice.

2.2. Science Council members were strongly supportive of the work and role of departmental and agency laboratories whose contribution to the development and implementation of science policy, and to monitoring, was often under-appreciated. There was also agreement that the criteria for assessing the effectiveness of direct government science services should be substantially different from those used to assess curiosity driven research undertaken in HE.

2.3. The Science Council welcomes recent improvements in the way CSAs work across government, for example the work of the Sustainable Development Programme Board, the Inter-Departmental Government Group on Water Safety and the DEFRA led Interdepartmental Group on Costs and Benefits.

2.4. There is considerable potential for Government scientific advisers to draw more widely on the expertise of learned and professional bodies and the Science Council can provide a central point of contact to facilitate this.

3. Question 3

Whether the views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is assessed

3.1. Many policy areas have wide potential impact and there should therefore be a multi-disciplinary approach to the gathering of scientific and technological evidence. It is important that consultation processes reach out broadly to involve all science areas that may have an interest, including social and behavioural sciences. It is paramount that the science, social science, engineering and technology bodies are also encouraged to act collaboratively in working with Government and that Government led review groups and advisory committees should reflect the breadth of potential scientific interests. Regional, research and education priorities and solutions may vary from sector to sector and from discipline to discipline and it can be counter-productive for a solution championed in one area to be offered as a blue-print for other environments.

3.2. For example, in exploring skills needs there may be significant differences sector by sector with some areas facing shortages at a technical/non-graduate level and others needing to increase the supply of graduates and post graduates with cross disciplinary backgrounds. Policies with regard to schools and higher education, and in skills areas, will need to reflect and respond to these differing priorities within science and technology sectors.

3.3. The capacity of learned societies and professional bodies to contribute to the development of science policy varies. Some are well endowed and receive some central support from government and may also have well-established income streams derived from publishing. Others are very small and do not benefit from government support of any kind. All have in common the fact that they interact with, and draw membership from the research environment, academia, industry and other user communities. Professional bodies especially are likely to cover a spectrum of scientific disciplines and specialisms, for example across water, clinical research or environmental sciences. Many include both science and engineering. The majority have excellent international links and networks and are well informed about global issues affecting their sectors. All have enormous potential and an important role to play in capturing scientific evidence and views and supporting the development of policy for agencies across government.

3.4. With these strengths, learned societies and professional bodies could play a key role working with government in areas such as horizon scanning and providing networks to advice and evidence. Feedback from member bodies suggests that this is not being utilised by CSAs or by many government agencies. The links with local government that do exist tend to be informal and very few and far between. The Science

Council can act as a point of contact for government, and others, in helping to identify organisations with interests in a policy area under consideration and we would welcome opportunities to explore how this could work.

3.5. To support public trust and confidence in government scientific advice, both the consultation processes and the preparation of advice should aim to engage all interested stakeholders and provide an opportunity to participate in a timely way. The inputs and outputs must be fully transparent and accountable. Science Council member bodies complained that they often put considerable effort into submitting evidence but that they were not then informed or made aware of the policy output or given other feedback.

3.6. Member bodies emphasised that a good consultation process would allow adequate time for them to gather evidence. Few will have existing standing advisory structures on the topic under consultation, and they will want to have time to consult with their members and draw together the appropriate experts and interests. Government has an unfortunate tendency to work to very tight timescales when consulting on key issues and policy areas. While the sector appreciates that this may sometimes be unavoidable, for the most part more satisfactory horizon scanning would enable consultations to be conducted over longer periods which would facilitate a much more considered input from the science community and other stakeholders. Consultations undertaken at speed have a tendency to play to campaigning groups and others whose opinions and views may already be well formed but may not be underpinned by scientific evidence.

4. Question 4

The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating

4.1. There are several different drivers of research, including curiosity, translation and development and policy needs: there may also have different research provider options. The Science Council supports the need for government departments to support their own high quality research and laboratory facilities that are able to meet the need to address urgent policy related issues or provide current data related to policy implementation.

4.2. Our member bodies voiced very different concerns with regard to funding and strategies for curiosity driven science research, research facilities, innovation and development research funding. Some were worried that inter-disciplinary research and translational research needs were not being met. Others expressed concern about the need to protect basic research funding. Generally the recent developments at RCUK to address interdisciplinary research needs and changes in health research funding were welcomed.

4.3. We believe that it is important strategically to maintain investment in basic research but at the same time to develop better ways of setting priorities more broadly to embrace both the inter-disciplinarity of issues such as climate change, and the need to invest and develop science across the UK in order to ensure both the workforce and enterprise can develop.

5. Question 5

Engaging the public and increasing public confidence in science and engineering policy

5.1. The Science Council, in its response to the recent DIUS consultation on Science and Society, welcomed the focus of the programme on the role of Government in establishing well informed science policy, securing public support for science, and in establishing the skilled manpower base to enable the UK to address the crucial issues facing society today. In response to our consultation, our member bodies supported strongly the need to engage the public in debate about way in which science was applied in and for society rather than in debate about scientific evidence and data.

5.2. However, an exception to this would be the practice of involving the public directly in the collection of data on specific issues. Examples include RSPB's Bird Watch Survey and the Joint Nature Conservation Committee's Tracking Mammals Partnership where, with guidance, individual members of the public become involved in monitoring and data collection. Such activities provide an opportunity to engage and explain the process of science.

6. Question 6

The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy

6.1. The GO-Science Foresight programme is felt to focus more on the opportunities within science and technology rather than wider horizon scanning. We consider that full science policy horizon scanning should aim to pick up on more political or attitudinal issues such as European legislation or the emergence of campaign alliances as well as workforce and skills issues that will have impact on the UK's ability to take

develop the science forward. We would also suggest that policy development processes should look more specifically at the international perspectives, including the way in which the UK contributes to and draws from international science initiatives such as the International Polar Year.

6.2. The Science Council welcomes creativity and innovation in the way stakeholders, including learned societies and professional bodies, are engaged in determining science policy and priorities. Members cited innovation within two government departments in particular: the Department of Health and The Defra Science Advisory Council.

7. Question 7

How government science and engineering policy should be scrutinised

7.1. The Science Council was disappointed that the Government decided to change the role of the Science and Technology Select Committee in the House of Commons and replace it with a committee that shadowed the Department of Innovation, Universities and Skills. The extension of the Committee's interests to embrace science are welcomed but there remains concern about whether the committee is able, or inclined, to undertake inquiries that overlap the interests of other government departments such as Business Enterprise and Regulatory Reform, Children Schools and Families, DEFRA, Department of Health, Communities and Local Government, DCMS, DFID, FCO, Home Office, Cabinet Office and HM Treasury.

7.2. There remains a concern that the Select Committee's priorities will remain the science issues that are within the remit of DIUS, principally science research funding and science and society, rather than the use of science within Government as a whole. In the past the House of Commons Science and Technology Select Committee was able to address issues from across science and publish reports from a broad perspective, across issues where narrow operational interest might be within one department: these reports have required a joined-up cross-governmental response. The Science Council believes that cross-governmental science focused inquiries should remain a high priority for the Select Committee.

7.3. In our consultation with member bodies the question was asked as to how Government centrally was held politically accountable for the quality of the science that it relied upon to develop policy. Although we acknowledge the central role of the Chief Scientific Adviser, and that the Minister of State for Science and Innovation attends Cabinet, it is not clear how the quality of scientific advice is made accountable at this level: there is no Minister responsible for the overall science agenda, as with Women and Equality and there is no ministerial inter-departmental working group, as for example on human trafficking. Similarly, there is no single point of contact in the House of Commons.

January 2009

Memorandum 40

Submission from the Royal Academy of Engineering

A Response on behalf of the Engineering Community to IUSS Commons Select Committee.

Introduction

1.1. This response has been prepared by the Royal Academy of Engineering with the endorsement of a number of engineering institutions and organisations, a full list of which is included at Annex A. It therefore concentrates on the implications of Government Science Policy on engineering research and the relevance of engineering to wider Government policy decisions.

1.2. We have taken the view that this Inquiry is concerned with the formulation of Science and Engineering Policy rather than the influence of science and engineering advice on general policy development (which was covered in some depth in the Committee's previous inquiry into Engineering and its case study *"Engineering in Government"*). Consequently, where there might be ambiguity in the questions as to whether it refers to "science and engineering policy" or "science and engineering in policy" we have interpreted the meaning as "science and engineering policy".

1.3. In the context of science policy, we feel it is important to recognise that the outputs of engineering research are fundamentally different to the outputs of pure science research in terms of its immediate usefulness. This can be generalised by thinking of the outputs of science and engineering research being at different ends of the Technology Readiness Level scale[163] developed by NASA and the US Military in the late 1980s to assess how close to useful deployment a particular technology might be. Engineering outputs will generally be at TRL 4 or above and Pure Science outputs at levels one to three.

[163] http://www.hq.nasa.gov/office/codeq/trl/trlchrt.pdf

1.4. The Haldane Principle, which has guided Government Science Policy for many decades, therefore has different meanings when applied to the direction of science and engineering research. For pure science, it seems reasonable that researchers themselves should be best placed to understand what direction their research should proceed in and they should not be constrained in their academic endeavours. For engineering, on the other hand, it seems reasonable that Government should express requirements in terms of general challenges that can be met through directed research and expect researchers to be able to contribute to the development of solutions to wider policy deployment problems. This generalisation is expressed here in terms of "pure science" versus "engineering", but could easily apply in any disciplines where there are marked differences in TRLs between pure and applied research.

1.5. Science Policy and the steering of the research agenda by Government, if it is to be more overt, should aim not only to address the needs of wider Government Policy deployment, but also the economic competitiveness of the UK and the grand challenges facing our society. While it is true that at the higher levels of technology readiness, there should be significant industry pull for promising technologies, there remain many pre-commercial technologies which require Government sponsored research and development if they are to reach the point at which industry pull will be sufficient for their continued development. The creation of the Technology Strategy Board (TSB) has recognised this need for investment in pre-competitive technologies, but it is not clear either where the boundaries of "science policy" and "technology policy" are in these cases or how they should interact. The TSB also has the role of addressing market failures where industry is unable or unwilling to take on the pre-commercial development of promising technologies.

2. *Does the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and should there be a Department for Science?*

2.1. The Council for Science and Technology does valuable work but only meets on a quarterly basis. The Cabinet Sub-Committee on Science and Innovation is a sub-committee of the Cabinet Committee for Economic Development and therefore only reports to Cabinet indirectly. Whilst both of these initiatives are worth supporting, neither could be said to put science and engineering at the heart of policy-making.

2.2. As the engineering community made clear in its response to the House of Commons IUSS Select Committee case study into *"Engineering in Government"*,[164] there is a clear need for engineering and science advice to taken on board across all areas of Government policy formation at the very earliest stages. This incorporation of engineering and science advice into policy making could be interpreted as a different issue to that of making science policy central to Government policy making. Investment in the science and engineering research base and the funding of research is a pre-requisite to the provision of sound science and engineering advice to Government and in this sense, "science policy" and the use of good science and engineering advice in wider policy formation are intrinsically linked.

2.3. The Council for Science and Technology is routinely asked to provide advice to Government on specific questions and in some instances to scrutinise the Government's response against commitments eg in reviewing the Government's response to the Royal Academy of Engineering and the Royal Society's joint report on Nanoscience and Nanotechnologies[165,.166] Their role has been to advise on science and technology issues which are by their nature cross-departmental and while it has advised on Government Science Policy, their remit is generally much wider than this.

2.4. The question as to whether there should be a Department of Science is complex and there is little consensus on the issue. Currently, science policy (the support and funding of the research base and its direction) lies within DIUS. The broader remit of ensuring that science and engineering research across departments is relevant, fit for purpose and contributes properly to the work of Government lies with the Chief Scientific Advisor, whose office, Go-Science, also resides within DIUS. Scientific and engineering research is funded and carried out by a number of departments where this research is in support of the department's policy objectives. As science and engineering research are important to many departments, it is not clear what the role of a Department of Science could be beyond the funding and maintenance of the university research base.

2.5. A strong argument for the establishment of a Department of Science is that it would signal a strong and lasting commitment by Government to continued investment in the UK science base. The strong recommendation from the UK Engineering Community would be that should the department be established, it should be called the Department for Science and Engineering.

2.6. Arguably, the process of developing science and engineering policy within Government could be improved by improving the scientific and engineering literacy of the civil servants within departments. In our joint response to the Committee's case study into Engineering in Government, this point is made very clearly and applies equally to the assessment of advice pertaining to general policy issues as it does to developing science and engineering policy.

[164] http://www.raeng.org.uk/policy/responses/pdf/Engineering_in_Government.pdf
[165] *Nanoscience and Nanotechnologies: opportunities and uncertainties,* Royal Society and Royal Academy of Engineering, July 2004, ISBN 0 85403 604 0.
[166] *Nanoscience and Nanotechnologies: A Review of Government's Progress on it's Policy Commitments,* Council for Science and Technology, March 2007.

2.7. The funding of scientific and engineering research in general has been high in the Government's agenda for at least a decade and it is arguable that it takes at least this long to see the benefits of that funding flowing into the UK economy. This presents a strong case to maintain the science budget at least current levels going forward. However, against international comparators, it could be argued that science and engineering in the economy in general are not high enough in Government's list of priorities with UK investment in R&D below the EU average and spending on higher education at only 1.3% of GDP, below that of all the UK's major competitors.

3. *Strengths and Weaknesses of How the Government Formulates Science Policy*

3.1. The creation of Departmental Chief Scientific Advisors and Scientific Advisory Councils has been a major advance in strengthening the Government's approach to formulating science and engineering policy.

3.2. The continued application of the Haldane Principle (however strongly) means that the Government has few mechanisms available with which to influence how the science base in the UK develops, short of the amount of money made available to it through the current dual funding mechanism.

3.3. Research themes can be set by the Government Office for Science and the Research Councils are able to bid for extra funds by proposing programmes under these themes. In this case, researcher directions are not directly set by researchers except for responsive mode funding within the themes.

3.4. The current system of funding research with some imposition of research themes appears to be fit for purpose, but there is no structured mechanism for feedback. The Research Councils are required to fund research which contributes to UK competitiveness and quality of life, but there seems to be little assessment as to whether these are more likely to be achieved sponsoring research in, say chemistry than computer science. The establishment of priority research areas for the Research Councils in areas such as energy and living with environmental change are useful in supporting the general challenges of wider Government policy.

3.5. The mechanisms by which research funding is directed through the Research Councils to individual researchers or groups and the top-down imposition of research priorities work well and have the confidence of researchers. However, some feel that the Research Assessment Exercise, administered by HEFCE to allocate block grant to universities in support of research infrastructure, has a strong distorting effect on the range and types of research carried out in the UK, not least because it is a competitive system between universities and could discourage collaboration between institutions though collaboration is often sought and rewarded by the Research Councils and Regional Development Agencies.

3.6. The competitive "call for proposals" method is often useful but there are some instances where another method would be more suitable for use by research councils or TSB—for example, to agree to co-fund company or university work where the company has already selected its preferred partner; or to scope out centrally what's required and then go and commission/implement it, systematically, on the basis of an objective analysis of who's best placed to conduct the work.

3.7. The continued health of the science base, which must be a major concern of Government science policy, is linked to the level and provision of technical skills throughout the UK economy. UK based research is both a provider to and user of technical skills in the wider economy and there must therefore be strong links between the Skills Councils and GO-Science to ensure its continued and future health and capabilities.

4. *Are the Views of the Science and Engineering Community central to the formulation of Government policy and how is the success of any consultation assessed?*

4.1. There are very strong arguments for the views and expertise of the science and engineering community to be taken into account in the formulation of wider Government policy and the Engineering Community's views on this matter are made in its response to the Committee's inquiry into *"Engineering in Government"* during 2008. Where science and engineering knowledge is central to a particular policy, then the policy should be based on the best available science and engineering knowledge, either through peer-reviewed research or, if that is out of date or insufficient, on the consensus opinions of a group of independent experts.

4.2. The more specific question as to whether the views of the science and engineering community should be central the formulation of science policy is less clear. It is clear that those involved in science and engineering research should be consulted, but it is not clear that their views should be central to policy formulation. A strong case could be made for additional funding for engineering research to strategically support the UK's manufacturing sector at a time of economic downturn, but as other areas of academic endeavour have more researchers, they may have a louder voice in Government and be able to sway Government funding away from nationally strategic areas.

5. *Is there a case for Regional Science Policy (versus national Science Policy) and does the Haldane Principle need updating?*

5.1. A good national science policy would take into account the strengths and weaknesses of the regions. Geographic clusters, which are strongly supported by some Regional Development Agencies, are important for innovation (as research has shown and as Government Policy already accepts). There is therefore a need for regional science and engineering policies that are coordinated with regional innovation policies. Regional policies should be dovetailed into national science policy and both should be complimentary.

5.2. Regional policies currently seem to work subserviently to national science policy and the establishment of clusters seems mostly to be driven by pre-existing industrial capacity in an area and consequent links with academia or the creation of high-tech clusters around established universities. Whichever way around particular clusters have developed, research funding should be channelled to universities based on the quality of the research proposals and not in support of any local cluster.

5.3. It should be recognised that while regional policies should dovetail into national science and innovation policy (so you do not for instance, end up with competing centres in each region), intelligently formulated innovation policy, usually RDA-backed but implemented in partnership with business, has achieved a great deal over the past 8–9 years that would not have been achieved if by policies driven from central Government. Regional innovation policy demonstrably works. Witness the remarkable turnround in the process industries in the North East, closely tied to the region's innovation-led Strategy for Success and with clear links to inward investment; or the very considerable support for automotive engineering (Warwick/PARD), sensor technology (QinetiQ) and hydrogen energy (Birmingham *et al*) in the West Midlands (driven by Advantage West Midlands).

5.4. The Haldane principle has guided Government's involvement in research funding for many years and for the majority of research disciplines, particularly for fundamental research and pure sciences, the concept that researchers themselves should determine the direction of research is strongly supported. Engineering research, however, can be aimed at applications much closer to commercial application. Where this is the case, it seems reasonable that Government should want to encourage research in areas that support national policies. Government currently does this through the Research Councils' priority research areas.

5.5. A further softening of the Haldane Principle seems to have resulted in "top slicing" of Research Council budgets to fund new bodies such as the Technology Strategy Board and the Energy Technology Institute. These new bodies have specific objectives and are able to fund research or development projects in different ways to those available to the Research Councils. This could be seen as diverting funds away for the fundamental science and research that the Research Councils are primarily responsible for and that provides the knowledge supply for exploiting tomorrow. There is clearly a role for these organisations in funding very applied research and demonstrator projects, the only question raised here is whether their partial funding through the Research Council budgets is fully compatible with the Haldane Principle.

6. *Engaging the Public and Increasing Public Confidence in Science and Engineering Policy*

6.1. There is a very strong case for researchers to be involved in public engagement, public dialogue and public understanding of science activities. These can all contribute to the general public confidence in science and engineering research if they are used appropriately. The question as to whether there should be public involvement in setting Government science and engineering policy is less clear. If, in controversial areas of research (stem cell research, genetic modification, systems biology etc) it is accepted that the Haldane Principle should be allowed to determine the direction of research, then public engagement, where the public are led to believe their views have a real impact on decisions, is of no value and can be counter-productive.

6.2. If any organisation is to use public engagement as a tool for developing public policy, it must commit to listening to and acting on the views that the public express. The purpose of the public engagement must be clear from the outset and the methods of engagement employed suited to the purpose.

6.3. The Royal Academy of Engineering and the wider engineering community responded to the DIUS Consultation, *"Science and Society"* in October 2008[167] and this sets out the views of the engineering community on the use of public engagement in science and engineering. In this consultation, DIUS was keen to understand how to "excite" the public about science and engineering so that the public is better able to engage with the science agenda. A final strategy for *"Science and Society"* is expected from the department early in 2009.

7. *The Role of GO-Science, DIUS and other Government Departments, Charities, Learned Societies, Regional Development Agencies, Industry and Other Stakeholders in Determining UK Science and Engineering Policy*

7.1. Science and engineering research cannot exist in a vacuum and there must be end users for the research carried out. At the very pure end of the research spectrum, there is room for research purely for academic endeavour, but as research becomes more applied, real world applications become the main drivers. It therefore follows that science and engineering policy should be based, to a significant degree, on

[167] http://www.raeng.org.uk/policy/responses/pdf/Scienceandsociety.pdf

the needs of, for example, UK based manufacturing industry and its potential to contribute to the UK economy as a whole. The wider science and engineering community, including industry, in the UK is therefore a key stakeholder in science and engineering policy.

7.2. Consultation with stakeholders is an essential part of the development of any policy, however, it must be recognised that consultees have specific positions for which they lobby and there is always a danger that policy is in effect set by those groups with the best lobbyists. It is the job of Government to take balanced policy decisions based on the input of consultation.

7.3. For consultation with stakeholders to be effective or meaningful, it is essential that DIUS and other Government Departments are intelligent customers for the advice received.

8. *How Should Government Science and Engineering Policy be Scrutinised?*

8.1. The current system of Parliamentary scrutiny allows for the various Departments to be scrutinised by the relevant House of Commons Select Committee. In general, this system seems to be adequate, but there is a strong case for a single Select Committee to have the remit to examine all Departments identify their science requirements and commission, manage, quality assure and use science and engineering advice.

8.2. The House of Commons Science and Technology Select Committee had this remit to examine science across all of Government before it was disbanded and replaced by the current IUSS Select Committee. It may be preferable for the role of scrutinising science across Government be incorporated into the IUSS Select Committee's remit rather than a new committee be created.

January 2009

Annex A

List of Signatories.

IMechE

ICE

IChemE

The Royal Academy of Engineering

BCS

IET

Memorandum 41

Submission from BAE Systems

Summary

There is no need for a separate Department for Science. BAE Systems recognises the Department for Innovation, Universities and Skills, supported by a pan-government network of Chief Scientific Advisers, as significant champions for science within Government.

There is merit in pure research but we firmly believe most research should be requirements driven, focused on enhancing the UK's economic performance and overcoming the challenges facing society at large.

Regional science policy would introduce duplication and inefficiency. In addition, regional objectives could conflict with national concerns, diverting focus and funding.

If Science and Engineering is to be at the heart of Government Policy we must ensure that world class scientists, engineers and technicians are developed through the UK education system. To achieve this goal we must increase our efforts to encourage the study of STEM (Science, Technology, Engineering and Mathematics) subjects from the earliest stages in the curriculum and to promote the widespread contribution science and engineering makes to the UK.

Greater recognition and support for the achievements of the science and engineering communities would increase public affinity and awareness and create a platform for better engagement and debate around major science and engineering issues affecting the UK.

SUBMISSION

BAE Systems employs 35,000 people in the UK (of which over 18,000 of these are in scientific, technical and engineering roles). It directly or indirectly helps to sustain over 100,000 UK jobs.[168] The company contributes in excess of £4 billion per annum to UK exports and flows down work valued in excess of £2 billion per annum to its UK supply chain.[168] Based on the productivity measure of value add per employee, the BAE Systems workforce contributes some 72% more than the UK average.[168] Every year BAE Systems undertakes research and development valued in excess of £1 billion.

The UK Defence Industry is the world's second largest and is founded upon world-class scientific, technical and engineering capabilities. The industry sustains investment in research and technology, people and processes that benefit not only its own purposes but also, through academic partnerships and its supply chain, other industrial sectors.

BAE Systems believes the UK should recognise science and engineering as national assets that must be sustained and continually enhanced to maintain the country's position as a leading global economy.

In this submission, we will address each of the Committee's questions separately, drawing upon the experiences and perspectives of our own company to demonstrate a case for placing "Science and Engineering at the heart of Government Policy" and the creation of a national strategy spanning government, industry and academia.

1. *Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science*

We believe the UK's science and engineering sectors make a pivotal contribution to the prosperity and security of our nation. The science, technology and engineering sectors underpin and sustain success in other areas such as finance, medicine and commerce. Emergent economies in the Middle East and Asia invest heavily in these sectors, recognising the significant and sustainable economic contribution they make.

Systems Engineering is playing a growing role in the development and operation of numerous complex systems on which modern society depends. The use of Systems Engineering principles is almost without limit (Within BAE Systems they are used in a range of programmes from "traditional" manufacturing projects through to people-focused training and service-based projects). Systems Engineering is a critical enabler to Government and industry and plays a key role in maintaining the UK's global industry competitive advantage.

In the UK we must continually enhance our science and engineering sectors to maintain and enhance our place as a global leader. Government science and engineering policy should take a holistic approach—starting with the initial introduction and education and extending to the stimulation of investment and the realisation of economically valuable business opportunities around the world.

Fundamental and applied research must be driven by the UK's needs—as a guiding principle we believe in a split of 80:20 favouring requirements driven research over pure research. In the US, mission-led funding agencies provide $\sim$70% of federal dollars in to US universities, influencing national strategies and research directions.

Science and engineering should be intrinsic to government thinking and closely linked to the objectives of individual government departments. A separate Department for Science could be seen to discriminate between science and the objectives of the Government. It would heighten the risk of valuable funds being diverted to produce more research publications without delivering value—currently around 90% of research council funding leads to publications, while only a very small percentage is pulled through to deliver value to industry.

How Government formulates science and engineering policy (strengths and weaknesses of the current system)

There needs to be real engagement of industry—this would ensure a better return on research investment and would encourage joint funding in areas of benefit to the UK as a whole.

The Chief Scientific Adviser approach provides an effective interface for industry into individual government departments. BAE Systems has established relationships with scientific advisers in departments relevant to our business interests. This enables research and development investment and strategy to complement and support the aims of government.

Aligning investment and strategy allows industry to determine far stronger exploitation paths for the resulting technologies and capabilities.

[168] Study of BAE Systems Economic Impact to the UK Economy—conducted by Oxford Economics (Published—April 2008).

Every year BAE Systems undertakes research and development valued in excess of £1 billion. Investment of this scale is sustained by the prospect and realisation of the potential revenue it generates. Aligning research outcomes with realistic industrial applications is the surest way of delivering the level of UK technological research investment needed for our science and engineering sectors to remain globally competitive.

One area where Government Policy would have a positive impact is to extend this principle of research alignment more broadly through a far reaching review of the manner in which research is funded through public and private investment.

Fostering innovation across all areas of the supply network is critical to the long term success of BAE Systems, and the UK economy as a whole. To ensure the best use of both government and related private sector investment it is important to create an "innovation pipeline", linking investments at all stages: from "blue sky" research to applied research; from applied research to incubation of opportunities; and from the incubation through to growth and exploitation.

It is important we create a balance between sustaining skills and capabilities within the UK to develop a global centre of excellence and understanding when we should buy "off-the-shelf" from other countries.

Whether the views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is assessed

As a leading employer of scientists and engineers BAE Systems supports any move to place the disciplines more centrally in the formulation of government policy.

However, we recognise that there are numerous considerations to be made in the creation of policy and any engagement should address the broadest range of stakeholders possible.

Successful consultation would generate policy that creates better coherence between the objectives of the science and engineering sectors (in industry, government, academia and beyond) and the broader objectives of UK Government policy and the nation's economic growth aspirations.

The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating

BAE Systems has sites located throughout the United Kingdom. We work closely with Regional Development Agencies, regional trade organisations and universities up and down the country. Nevertheless, we see little merit in individual regional science policies.

Instead we believe in policy that is devised nationally, which can be easily enacted on a regional basis. Our experiences on the ASTRAEA programme, part of the National Aerospace Technology Strategy looking at the technological and regulatory issues in opening the UK airspace to unmanned vehicles, suggests that we need to create a framework in which this can be done easily. This £32 million programme is considered very successful by its major stakeholders, yet, in order to get underway, required 13 discrete funding bodies, 43 separate agreements and 176 signatures to get underway.

BAE Systems' experiences with the Systems Engineering Innovation Centre, established in 2002 and based at Loughborough University, have shown how the Regional Development Agencies, in this case East Midlands Development Agency, working in partnership with industry and academia can create high quality research environments that deliver benefits to all those involved.

The Haldane principle has been interpreted to mean that research decisions should be made by the researchers themselves, on scientific principles, removed from political considerations. From our perspective this could be seen to perpetuate the situation whereby the application of research funding fails to match the challenges facing the economy, industry and society at large.

From our perspective this could be seen to perpetuate the situation whereby the application of research funding fails to match the challenges facing the economy, industry and society at large. Our position is that there is merit in research based on academic curiosity the emphasis must be on research with obvious potential for application and exploitation. It is on this basis that we have developed our strategic partnerships with four leading UK Universities in Aeronautical Engineering (Cranfield), Support Engineering (Cambridge), Systems Engineering (Loughborough) and Distributed Data and Information Systems (Southampton).

Engaging the public and increasing public confidence in science and engineering policy

Collectively we must do more to raise public awareness of science and engineering. As a nation we are happy to praise the achievements of scientists and engineers in history and Newton and Brunel are often cited as examples of Britain's technological and scientific "greatness". Sadly, we appear less adept at recognising those who currently continue to advance science and engineering in this country.

Excellence in science and engineering is worthy of reward and recognition and collectively we must consider how we can create role models by highlighting the contribution science and engineering make to society and instilling an understanding of their value in the minds of the general public.

Increasing numbers of young people are enrolling in undergraduate and post-graduate degree programmes in STEM. Nevertheless there remains an imperative to attract the quantity and quality of people needed to sustain this skill base. BAE Systems uses an innovative theatre-based schools road show to give 9–13 year olds a new perspective on science, technology, engineering and manufacturing. 43,000 students have seen how these subjects affect their everyday lives. Through this programme we seek to influence the decisions that they make when choosing GCSE subjects; decisions that can determine whether they can pursue a future career in science, engineering or technology.

It is critical to the engagement of young people, their perceptions of the subjects and their desire to pursue those subjects through to A-Level, diploma, further education and higher education that teachers are well qualified, enthusiastic and of a high quality. BAE Systems was the first corporate sponsor of the National Science Learning Centre at the University of York and has committed £1 million to support the high quality professional development for everyone involved in the teaching of science in UK primary schools, secondary schools and further education colleges.

Initiatives encouraging the transfer of skills from industry to education, such as the "Transition to Teaching" programme, will also support improvement in the quality of science teaching in schools. This will help ensure that science teachers are provided with best practice training in the delivery of science teaching in the classroom. While we in business are fortunate to receive regular development, a recent survey by the Wellcome Trust showed that only half of science teachers had any subject specific training in the last five years.

Furthermore, we need to engage with sections of society in which the study of engineering and science is not prevalent. In 2008 BAE Systems ran a pilot activity in Preston and Blackburn to reach out to ethnic minority students, who are not currently applying for apprenticeships with the company. We will be reviewing the project with the schools early next year and planning to build on this with more activity in 2009.

Industry can also provide direct exposure to the reality of the science and engineering workplace. Each year we host over 700 14–16 year olds on work experience placements—providing an incomparable insight into the opportunities a science and engineering career can offer.

There is evidence of increased awareness, understanding and application of systems engineering in the UK. In parallel we are experience a shortage in skilled systems engineers to meet the demands of the defence sector. Government and industry work should ensure our education system—from schools through to universities—provides sufficient, suitably trained systems engineers, supported by continued professional development throughout their careers. In addition, research funding should be invested in a manner that enhances the nation's systems engineering competencies and, as a result, its future economic competitive advantage.

BAE Systems is not alone in making these investments and other companies, various governmental and non-governmental organisations run programmes with similar goals. A national co-ordinated framework could widen participation from small and medium-sized businesses and align the efforts of industry and government, yielding better long term outcomes. We would encourage the Parliamentary Committee to consider this opportunity as part of its Inquiry.

The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy

Influencing UK science and engineering policy is the responsibility of all organisations with an interest in the growth of the UK economy. While the final decision and direction of policy clearly lies with the Government it is, in our view, incumbent upon the Executive to ensure the necessary consultation takes place. Doing so would ensure policy is well supported, realistic and in the best interests of the UK.

Science and engineering are not discrete activities that take place independent of wider considerations—this is one of the reasons BAE Systems does not support the creation of a separate Department for Science.

Government Policy should support the objectives of this broad community of stakeholders and, in our opinion, provide incentives in areas deemed beneficial to the UK's economy growth.

How government science and engineering policy should be scrutinised

Parliamentary scrutiny of Government Policy, such as Select Committees, remains the responsibility of our elected representatives in Parliament. However, a greater knowledge and understanding of the principles of science and engineering and the challenges facing the community would form a basis for better informed scrutiny.

We also believe the consultation process employed in the formulation of policy should continue through to the scrutiny stages. This would ensure the link between the initial objective and the programme devised to deliver it is maintained.

January 2009

Memorandum 42

Submission from the Royal Society of Edinburgh

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

Summary

- Science[169] at the heart of Government is a crucial issue, given that science pervasively underpins many and possibly most of the issues important for good government.
- The Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology play important roles but are not sufficient as means of placing science at the heart of government. A long term, adaptive strategy for science needs to be owned at the highest level of Government and articulated in terms of the objectives, processes and institutions required to ensure the excellence of the science base and its efficient exploitation. The creation of a Department for Science could be an effective means of ensuring this.
- The creation of effective policy and its implementation not only depend upon top level engagement but also on intermediary bodies that through their understanding of operational reality are able both to contribute to the development of policy and its efficient execution.
- The strengths of the current system include the existence of efficient, experienced and successful bodies such as the research and funding councils, the existence of chief scientists in all departments of UK Government (though not of devolved administrations) and the existence of national academies able to contribute highly expert, independent advice.
- Its weaknesses include the absence of a well articulated science strategy with powerful champions; the difficulty of achieving cross-departmental coordination (the potential of the committee of chief scientists needs to be realised); the relative failure of policies for cross-disciplinary research support and its application; the emerging gaps between UK and devolved administration policies for science; and the failure to engage with the emerging European Research Area.
- The capacity of the non-governmental science community, particularly that of the universities, is very much greater than the diminished science capacity of government. It should be a priority for government to devise policies to draw on that external capacity, whilst recognising that the role of the science community is to provide evidence, not to determine public policy; that is for government.
- There is a need for separate but interacting regional as well as national science strategies, but these should also interact with an EU level strategy.
- Public engagement and dialogue should be major components of science strategy.
- Scrutiny of science policy needs to be extended to include the interfaces between regional, UK and EU policies.

1. The Royal Society of Edinburgh (RSE), Scotland's National Academy, is pleased to respond to the Innovation, Universities, Science & Skills (IUSS) Committee inquiry, *Putting Science and Engineering at the Heart of Government Policy*. The RSE is well placed to respond to the issues raised by the inquiry as the Society's Fellowship includes distinguished individuals drawn from Science, Medicine, Arts & Letters, Engineering & Technology, the Professions, Industry and Commerce. We respond in turn to each of the questions in the inquiry document, which are set out in *italic* below.

Are the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology successful in putting science and engineering at the heart of policy-making and should there be a Department for Science?

2. The evidence of cause and effect in nature and society that are yielded by scientific knowledge and understanding is vital to most areas of public policy. At the same time, the application of scientific knowledge has and will continue to change the world we live in, in ways that are fundamental to the operation of society and the economy. It is therefore crucially important that Government creates mechanisms whereby policymakers are able to access and utilise the very best scientific advice; and which are also able to maintain

[169] We use the term "science" as a shorthand for science, technology, engineering and mathematics (STEM).

and enhance the strength, effectiveness and morale of the science base. The fact that some scientifically established relationships go against the grain of popular belief or prejudice must not be allowed to inhibit their application in policy; a not inconsiderable challenge to politicians and civil servants.

3. It is therefore of great importance that there is a strong advocacy for science and engineering at the heart of government including Cabinet level. Equally it is important that mechanisms exist within government and across departments to ensure that scientific understanding is acquired and applied.

4. A number of vital functions are required of government:

(a) *The means to create a long term strategy for science in terms of objectives, processes and bodies, that is agreed and supported at Cabinet level.* The 10-year science and innovation investment framework published by the government in 2004 was an important step forward, but has not been followed by further development at a high level. The Cabinet Sub-Committee on Science and Innovation could be a means of doing this, although it seems that its principal current function is to address particularly urgent issues. If it is not to act at a high strategic level, there is a case for the creation of a Department for Science. With the demise of Lord Sainsbury as Science Minister, the strategic awareness and the vital engagement of the science community that he created has waned. It is important that these are redeveloped. Much responsibility for processes of awareness and engagement also falls on the shoulders of the Chief Scientific Adviser.

(b) *Processes that ensure routine access to scientific advice and the coordination of responses across government*. In principle this should be the role of departmental chief scientists. Now that all/most Whitehall departments have a chief scientist, we would like to see chief scientists working more effectively, under the Government Chief Scientific Adviser, to maintain and construct robust advice routes and to coordinate actions across government. Capacity for the latter depends crucially on the willingness of departmental ministers to engage with coordinated action. Leadership from Cabinet or Prime Ministerial level is crucial in ensuring this.

(c) *The means to access scientific advice to respond rapidly to short-term issues and crises.* It important that government perennially ensures that advice routes are in place so that the best advice can be tapped to respond to such issues. The issues will change through time, and it is important to review the existence of sources of appropriate advice and routes through which it can be accessed. Some advice can be derived from specialist government institutes. Much will come from universities and other bodies. Mechanisms should be developed that will permit government to exploit the enormous resources of the universities, which are currently less than optimally used.

(d) *Processes that ensure input from independent expert bodies on major issues.* The Council for Science and Technology produces reports for government and intervenes with advice on specific, long-term issues of importance. We believe that this is an important function that has proved to be valuable, and is a means of bringing in the best external advice on particular issues. The role of learned societies is also important in this regard.

5. Given this analysis, and in conclusion, science at the centre of government is more than a matter of a cabinet committee or the CST, but a process that is able to ensure coherence across government. In principle, a Department for Science might seem to be a means of doing this, backed up by strong Cabinet-level leadership.

6. It is also important to recognise that although much of the terrain of science is indeed thoroughly known and understood, many highly problematic issues of the day lie at the limit of our understanding, and are associated with considerable uncertainty. It is vital in these cases that Government does not hide behind falsely claimed scientific certainty, as it did in the cases of BSE and Salmonella, but recognises the uncertainty and expresses it clearly when political judgements need to be made. The development of a discourse that is able to admit uncertainty in science-related issues should be an important priority for Government.

What are the strengths and weaknesses of the current system through which Government formulates science and engineering policy?

7. The development, formulation and execution of policy not only depends on clearly defined primary objectives and high level engagement and support, but also on the existence of intermediary bodies familiar with operational processes, constraints and motivations that are able to translate high level government policy objectives into policies that stimulate an appropriate operational response. This latter function is fulfilled by two types of body, those "arms length" bodies (principally the Research Councils, which iterate with Government through the Director General of Research Councils (DGRC), University Funding Councils and Regional Development Agencies) whose actions direct, fund or influence the major part of the UK science base in universities and institutes, and those governmental bodies that directly control government science activities.

Arms-length bodies: Research Councils

8. In comparison with other European systems, the Research Councils are effective in supporting basic research, in balancing major directed, thematic programmes with responsive-mode funding, analysing and developing initiatives to address issues such as science-based innovation and science and society, and feeding their perspectives to Government through the DGRC either to inform and refine Government policy imperatives or to suggest new areas of priority for policy.

9. Their principle weaknesses are:

(a) The perennial failure, notwithstanding protestations to the contrary, in developing policies and practices to support cross-disciplinary research. This remains particularly acute across the divide between natural science/engineering/medical science and social science, where science-directed ESRC programmes tend to link only poorly with cognate areas funded by other research councils.

(b) The difficulties of generating polices for their institutes. Many institutes were set up to focus on issues that were currently important, but where science priorities have changed, many institutes either defend out-moded priorities or have difficulty in adapting to new ones because of limited staff turnover.

Arms-length bodies: Funding Councils

10. Just as happens with Research Councils, they are able to interpret ministerial guidance and use their own expertise in a very effective way to determine the most effective processes through which government priorities can be promoted and to identify key areas for policy development.

11. The dual support system for research is a central plank of policy underpinning university research and is one of great strength. It derives from its capacity to provide money for research without prescribing how it should be used. It permits universities to use their creativity and back their own hunches in pursuing new research directions. In some other systems, such as that of Sweden, almost all money for research now flows through research grants to individuals, such that the university is now merely a "research hotel", deprived of its potential to use its creativity in developing new research directions.

12. The value of relative autonomy is exemplified by the Scottish Funding Council's central role in devising and planning, in consultation with the Scottish universities, the pooling arrangements that have created powerful cross-university structures in science in Scotland.

13. A major policy weakness has been the absence of a clear signal from funding councils about the level of selectivity in research that is in the national interest. In practice, a relatively small number of universities have been awarded the lion's share of funding. There has however been no policy for research-related activities of other institutions. The value of the RAE and what will follow it is diminished without a clear statement about the rationale, at the level of the whole system, for patterns of funding, so that institutions can make appropriate long-term plans. What shape do we want the university science base to have, and what type of functional diversity should it display? These issues are matters for Government as well as the Funding Councils.

Arms-length bodies—RDAs

14. Although policies for the health of basic research are best created at national level, economic benefits that involve the application of science are realised at regional and local levels. The development of the RDAs has been in principle an important step forward. However, we are only able to comment knowledgeably about Scotland's RDA, Scottish Enterprise. Its strengths are its capacity to identify and to exploit the potential of the research base to benefit innovation and business in Scotland, through relatively close contacts with the Scottish Funding Council and, through its local bodies, with individual universities. It has been able to fund infrastructure projects in universities and institutes where these have been seen to have potential to stimulate innovation, inward investment and business growth. It has also created Intermediary Technology Institutes designed to act as a proxy for the missing "market pull" on the science base in Scotland.

15. The weakness of Scottish Enterprise has been its tendency to work through strategies that depend on collaboration from the science base without involving it in prior debate and joint planning, thereby losing its expertise from the planning process, and often creating sub-optimal projects or projects that need reverse engineering.

16. A further negative development has been the recent centralisation of Scottish Enterprise activities and the loss of local capacity.

Direct UK Government capacities

17. Our comments here follow on from those in paragraphs 2–6 above. Current strengths include:
    (a) Government minister with responsibility for science;
    (b) Cabinet sub-committee for science;
    (c) high profile chief scientific adviser with high level access;
    (d) committee of chief departmental scientists, although this could be more influential in developing a cross-cutting science agenda;
    (e) Council for Science and Technology with a capacity to bring independent expert advice to bear on important issues that need to have greater traction in Government;
    (f) Technology Strategy Board able to identify the need for and to provide sustained support for important technological opportunities.

18. Weaknesses in the policy forming process include:
    (a) Uncertainty whether a strategic view of the structure, priorities and strength of the UK science base as a whole is sufficiently provided by Cabinet sub-committee. If the sub-committee is unable to do this, and the Society is sceptical that it can do so, then given the nature of committees and the limited resource available to it, the case for a Department of Science with a minister at the Cabinet table becomes strong.
    (b) There is vital need to ensure coordination across departments. The committee of chief scientists is a step in the right direction, but ministers themselves need to support such endeavours. Again, this might best be done through a Department of Science headed by a Cabinet minister.
    (c) More effective ways need to be found of accessing the enormous range and depth of expertise in the universities, and indeed of prestigious learned societies such as ourselves, the Royal Society, the Academy of Engineering, and the Academy of Medical Sciences.

19. Other priorities include:
    (a) The reality of devolution should be recognised. Too many UK bodies have effectively become English bodies, through their failure to recognise and to engage with the structures that have been developed in devolved administrations.
    (b) Contracts for research in support of evidence-based policies should be placed wherever it can be done best, and the research should be subjected to high standards of peer review.
    (c) The policy making process should be separated from the STEM evidence which is taken into account in formulating it, and that the evidence should, for important issues, be made publicly available in plain English.
    (d) Procedures should be adopted which ensure that public values are taken into account during the stage of policy formulation.
    (e) A process of horizon-scanning should be routinely developed which identifies difficult science-based issues before they become matters of acute controversy (eg nuclear waste and MMR), so that authoritative evaluations of the underlying science and its uncertainties can be published in plain English, to avoid hurried policy decisions being made at times of acute controversy. The horizon-scanning function within GO-science has not been as effective as we would have hoped.
    (f) The social sciences should be more routinely engaged to understand better how business, universities, government agencies and research institutions can interact more effectively and how public values can be included in the formation and implementation of policy.

Are the views of the science and engineering community, or should they be, central to the formulation of government policy, and how could the success of any consultation be assessed?

20. The government has political, social and economic objectives that it wishes to pursue that reflect the dynamics of political debate. The STEM community has no special locus in determining these priorities, although scientists may be heavily involved as individuals. The primary role of the STEM community is to provide evidence about matters of governmental concern (eg the psychological impacts of cannabis), to identify issues that require a governmental response (eg the probability of severe climate change), or evidence of the options that could underlie policy decision about how to respond to such issues (eg low emission energy generation options). Such involvement by the STEM community may be quite fundamental to the eventual policy, but it is for Government to determine what that policy should be, according to their political objectives, not the STEM community. Science is concerned to understand the working of nature, it is for society to determine how that understanding should be used.

21. A major problem lies in the extent to which scientific understanding has extended to so many diverse issues. Science is now such a powerful and pervasive source of understanding that there are few areas of government policy to which it do not apply. At the same time far more scientific knowledge lies outwith the ready reach of Government than within it, where the direct STEM support for policy within Government is relatively small. In many areas, direct support has diminished whereas the range of expertise needed to

underpin policy has greatly expanded. The question for Government is no longer whether the input of the STEM community to policy formation is necessary, it is clearly vital, but how best that input can be achieved.

22. There is a serious need to enlist support for public policy from the wider science base, particularly from the universities, which contain unique ranges of competence and therefore a unique capacity to address complex cross-discipline issues. To achieve this, Government needs to analyse its needs more rigorously and reach out more effectively to the universities. Universities need to recognise and reward the importance of this activity, and both need to discuss the funding basis that would enable this development. It is timely both for UK and devolved administrations to consider how to address their particular needs.

23. It is highly questionable whether the conventional process of consultation about a proposed policy is adequate to the need. This Society responds to a relatively large number of consultation documents in any one year. In doing so it is able to bring together, at very short notice, groups of expert Fellows from across the disciplinary spectrum (the RSE is unique amongst British national academies in the breadth of its fellowship) that in most cases far outweigh the experience that is readily available to Government departments. In far too many cases, the underlying technical basis of consultation papers is deeply flawed. In some, through persistence, we are able to achieve some reverse engineering, but in many cases we suspect that the purpose of consultation is simply to claim that it has occurred. It would be far better if Government were able to create imaginative mechanisms that would entrain high levels of expertise from the start. The relationship between the US Government and the National Academy of Sciences would be worth inspection in this regard.

24. The extent to which Government taps scientific expertise can be strongly influenced by the ethos of the particular department, with some being particularly good at recognising the need to have access to outside scientific expertise. However, there are some departments that do not recognise this need. The appointment of Chief Scientists in all departments in Whitehall is an important first step, but as yet no clear process where all directorates of the Scottish Government can access necessary scientific advice, or even in some cases understand where it might be necessary. This should not be difficult in Scotland, thanks to its small size and the excellence and relatively large size of the Scottish science base. It should be a priority.

25. One component of the STEM community whose voices are inadequately heard in government is that in the SME technology sector. In Scotland, such companies are the major employers of practising STEM graduates. These SMEs do not have the time or energy to ensure that they are represented on government committees, such that the distinctive issues for the sector are inadequately recognised.

26. It is important that there is a consultation network that infiltrates and engages the most appropriate constituencies where informed opinion can be found. Both the STEM community and the policy-makers need to be confident in the modes of communication that sustain and access the network. The Royal Society of Edinburgh and the Royal Society of London are important parts of such a network, as are the learned societies and professional bodies.

Is there a case for a regional science policy (versus national science policy) and does the Haldane principle need updating?

27. Not only is there a need for regional science policies, but the European dimension of science policy also needs to be addressed. The UK has been highly remiss in not engaging with the debate about an emergent *European Research Area,* which would benefit greatly from more formal UK involvement in its creation. The question is: what are the functions that should be located at European, UK and regional levels respectively? We offer the following prescription:

(a) *European level:* A European common market for research could provide a powerful and creatively competitive framework for the UK science base, through joint planning and procurement of major infrastructure and of major, globally significant research programmes; a highly competitive frame for basic research funded through a well-funded European Research Council, and enhanced mobility as a contribution to greater dynamism.

(b) *UK level*: Focus on maintaining the competitiveness of basic research; provision of national level infrastructure; sustained term support for UK strategic priorities; national processes that ensure that a national STEM network is effective and can be drawn on efficiently to respond to governmental and social priorities.

(c) *Regional level:* Much economic benefit from the science base is realised at local and regional levels, and it is important that regional players have a shared view of regional economic priorities. In addition, the regions should want to compete effectively for national and EU funding and in attracting inward investment. A regional science strategy that is nested in national strategy should be designed to achieve these objectives.

28. The realities of devolution require an extra dimension in a regional policy in view of the divergence of many areas of public policy between devolved and UK administrations. To this end, the Scottish Government has recently published a science strategy. However, in its desire to address distinctive Scottish priorities, it does not adequately address the mechanisms that will maximise benefit from UK-level integration. It is vital that Scotland remains an integral part of the UK science base. A large scale system

has greater capacity to maintain research diversity and thereby the flexibility to pursue new directions; to make available otherwise unaffordable opportunities to its most competitive groups; and to stimulate excellence through its openness to competition and the wider horizons that it offers.

29. The post of Chief Scientific Adviser to the Scottish Government has recently been established, supported by a Scottish Science Advisory Council. These are welcome developments, but as yet, scientific advice is not as pervasively available within the Scottish Government as it needs to be.

30. The science base in Scotland has benefited greatly from a joint initiative of the Scottish Funding Council and the Universities, to create "pooling" in a number of key science areas (Physics, Chemistry, Geosciences, Life Sciences, Informatics & elements of Medical Sciences). This has created managed networks of the best researchers from the Scottish universities. It has provided a framework for integrated schools in the vital area of graduate education. It has simplified the academic landscape so that the strategic priorities of Scottish universities are clearer to research funders, made it easier for business to identify research that may be relevant to its needs, and, critically, proved to be a powerful attractor for international academic talent into Scotland. It also includes links with research institutes. It is a model worthy of notice, and reflects the creative adaptivity that a regional element of strategy permits.

Engaging the public and increasing public confidence in science and engineering policy

31. Because of the impacts of new scientific understanding and technological developments on the lives of individuals and society, it is imperative, particularly in a democratic society, that all are stakeholders in the scientific venture. Science must be a public rather than a private enterprise. Science and the technologies that flow from it offer options and opportunities. How the latter are exploited should be in principle a decision for society. In this interplay, scientists need to engage with fellow citizens and policy makers in explaining the potentials and limitations of their science, whilst recognising the critical importance of social values in determining how scientific understanding should be used. Governments and bodies in civic society need to collaborate in creating the frame within which these interactions can occur.

32. If these processes fail, there is every prospect that the scientific creativity and understanding that is increasingly required to cope with global problems will not be exploited, that we will fail to realise the potential that science offers in the economy and in support of public policy, and that we will be indecisive and ineffectual in the face of the many challenges that confront us.

33. In its comprehensive response to the DIUS consultation, *A Vision for Science and Society* the RSE identified the following primary objectives of a policy for science and society:

(a) To help all citizens understand as much as possible how the science enterprise works, so that they can understand and engage with it.

(b) To develop habits and processes that give society a say, possibly in the priorities for science, but certainly in the introduction of potentially disruptive technologies, and how we should respond to global problems.

(c) To ensure that mechanisms exist to provide the scientific support that public policy needs.

(d) To ensure we have the scientists and engineers needed to support the development of the economy, social services, infrastructure and the development of more sustainable ways of living on the planet.

(e) Finally, to recognise that the rationale for science and funding of science is not only utilitarian, as described in the four preceding imperatives. The instinct to understand, to find meaning, and to map the cosmos and ourselves is deeply human; a common pursuit that all societies have shared. Science is a fundamental part of that enterprise and should be encouraged and supported as such.

The importance of Public Engagement and Dialogue

34. The purpose of such dialogue is not to determine policy but to inform it. It is crucial that the questions are posed in such a way that the outcome of the dialogue process has the potential to be useful in policy development, and that Government does not commission dialogue on questions where it has already determined its policy and is simply looking for public agreement. Dialogue is most likely to be fruitful where Government has a coherent view of what it wants from the process, where it is has a blank policy canvas, or where dialogue can change aspects of a pre-existing policy direction. Unlike written consultation exercises, dialogue processes are open and their outcomes readily scrutinized. To be seen to ignore them can undermine the credibility of the policy and the dialogue processes in general. It is also important to assess the circumstances under which "upstream engagement" may be appropriate. Another problem is the difficulty or impossibility of knowing the outcomes or practical applications of emerging science or technology. This may undermine the incentive for public involvement and make it easier for special interest groups to dominate debate and promote their agenda. The timing and framing of dialogue is crucial in avoiding premature foreclosure on emerging technologies. Careful framing of the question could however avoid this outcome whilst uncovering areas of public concern that could beneficially influence the research and development agenda.

35. There are signs the UK Government is developing effective processes for dialogue, but three issues need to be addressed: appropriate horizon scanning processes need to be associated with careful judgments about where dialogue would be appropriate and at which stage of emergence of an issue it should be applied; issues must be framed in such a way that dialogue can influence the development of policy; and a corporate memory of the process must be kept.

Science education in school

36. A key issue centres upon the provision of science education in school. Our schools not only prepare those who will go on to career in science and technology, but also those who will not, and most of these non-scientists need to have some comprehension of how the science works and how it affects their lives. We believe that much science education at school does not prepare these citizens well.

37. One problem is the widespread misapprehension that science always gives unambiguous and definite answers. The misapprehension is both understandable and unfortunate. Understandable—because the science taught in school is about things we understand very well. Unfortunate—because many innovations in science lie at or beyond the frontiers of what is currently known, which makes it harder to define potential side effects and forecast risks. The consequence is that schooling in science often does not prepare students for the "real world" of science they will meet in later life. For example, they and their parents are confused by conflicting views about nutrition, vaccination, HIV and global warming, and by the cacophony of conflicting certainties and crude characterisations propounded in the media. Part of the challenge for science education should be to familiarise pupils with the concept of uncertainty and the fact that much scientific understanding is provisional, without corroding their confidence in the scientific process.

38. In Scotland, the development of the new *Curriculum for Excellence*, which has the potential to create more flexible approaches, should be exploited to take these issues into account in the later stages of school education. The intention is to develop cross-cutting, interdisciplinary themes; to address applications and explore real-world relevance; and focus on active learning in open-ended investigations, together with discussion, debate and critical thinking. The phasing of these processes is critical, however. The nuts and bolts of understanding remain the disciplines which have been the means whereby reality is analysed and understood and are still powerful drivers of new knowledge. The integration of these disciplines and intellectual concepts like complexity are advanced skills and should not be introduced at too early a stage. To address these challenges effectively, there needs to be far more opportunities for continuing professional development (CPD).

The roles of universities in the science and society agenda

39. An essential step is a change in culture whereby societal engagement is rediscovered as a major function of the universities and regarded as a natural extension of their research function, as well as one which permits them to promote their research into the public domain. One way to facilitate this culture change would be to recognise initiatives in terms of promotion and pay. The research councils could also strengthen the requirement for societal engagement in research programmes. We are sceptical that another stream of funding is called for. To stratify university activity into an excessive number of specific streams that are individually funded as if they were not part of the same educational and research enterprise would be counter-productive. The funding for societal engagement should be embedded in existing funding streams.

The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy

40. We have dealt with most of these issues in preceding sections of our response. In broad terms, the contribution of scientific understanding to good government is maximised when there is policy framework that ensures:

(a) that a science strategy is supported at the highest level of Government;

(b) that the strategy is wide ranging, comprehensive and intellectually coherent;

(c) that the best possible advice reaches those parts of government when & how they need it;

(d) that where appropriate, policies are coordinated across government rather than stopping at inter-departmental boundaries;

(e) that government encourages and is open to independent scientific advice and that it learns where these sources are;

(f) that the public are engaged when there are science-based issues that present ethical challenges or difficult choices;

(g) and that the need for different levels of strategy (European, UK, regional) is accepted and that there is integration between these levels.

How should government science and engineering policy be scrutinised?

41. Scrutiny by the Westminster and devolved parliaments and their committees should continue to be rigorous. This in itself poses a problem. There is a "scrutiny gap". We have argued above for there to be "nesting" of policies between EU, UK and regional levels, but nesting based on complementarity and integration. Failure to achieve this risks gross inefficiencies. There are already examples of Scotland unnecessarily reinventing approaches that are already developed in England and *vice versa*. It is important that there should be some form of common scrutiny of these interfaces, rather than only separate scrutiny from European, UK and devolved parliaments.

42. Public scrutiny is also crucial. Wherever possible government should be transparent about the information sources that inform policy decisions and the relationship between evidence and policy. Public engagement and dialogue, unlike written consultation exercises, dialogue processes are open and their outcomes readily scrutinized.

Additional Information and References

In responding to this consultation the Society would like to draw attention to the following Royal Society of Edinburgh responses which are of relevance to this subject:

- The Royal Society of Edinburgh's submission to the review of *Guidelines on the use of scientific advice in policy making* (January 2000)
- The Royal Society of Edinburgh's submission to the Scottish Executive Enterprise & Lifelong Learning Department's consultation into a *Science Strategy for Scotland* (July 2000)
- The Royal Society of Edinburgh's submission to the UK Government consultation, *Science and Innovation: Working Towards a Ten-Year Investment Framework* (April 2004)
- The Royal Society of Edinburgh's submission to the Scottish Executive's consultation on a *Science and Innovation Strategy for Scotland* (December 2006)
- The Royal Society of Edinburgh's submission to DIUS, *A Vision for Science and Society* (October 2008)

January 2009

Memorandum 43

Submission from Universities UK

1. Universities UK is delighted to contribute to the Select Committee enquiry into "Putting Science and Engineering at the heart of Government Policy". As the major representative body for the higher education sector, Universities UK has 133 members who are the executive heads of the universities in the UK. Universities UK works closely with policy makers and key stakeholders to advance the interests of universities and higher education.

2. This submission indicates the considerable work universities are undertaking to support and promote Science and Engineering as part of Government Policy. These areas include: development of the Higher Education Innovation Fund (HEIF); increased knowledge transfer activities; encouraging an interest of careers in science and engineering to students; skills development for those already studying; and consideration of the regional spread of science and engineering departments. Work on the Research Assessment Exercise (RAE) also forms part of Higher Education's contribution to this agenda.

3. It is essential that public policy is underpinned by high quality research and evidence. Universities UK therefore, agrees with the Council for Science & Technology[170] (CST) that we need a healthy engagement between academics and policy makers. UK higher education is well placed to contribute to and inform public policy making. The UK is home to some of the best research universities and institutions, representing 1% of the global population but producing 9% of the world's scientific publications and 12% of scientific citations. The recent Research Assessment Exercise confirmed the UK's leading global position, with over half of submissions (54%) judged to be either "world leading" (17% in 4*) or "internationally excellent" (37% in 3*) across a broad range of subject areas.

4. From the university perspective, through mechanisms such as the Higher Education Innovation Fund (HEIF) [in England], there has been a step change in knowledge exchange activities between universities and the public and private sectors, which has changed the culture of institutions and resulted in real economic and social benefit to the UK

5. The *Higher Education—Business and Community Interaction Survey* for 2006–7 showed that income from collaborative research rose by 12 per cent in the UK to nearly £670 million. Projects with Research Councils UK as the public funder accounted for the greatest share and increase in collaborative research.

[170] *How academia and government can work together,* 2008

Spending on contract research increased by 20% with an associated increase of 12% in the number of interactions. The largest part of this increase was non-commercial partners, accounting for over £446 million of the £783 million total. Combined, all research-related activities totalled over £1.4 billion in 2006–07.

6. Despite the progress made by universities over the last 10 years we acknowledge the CST's concern that "engagement between academics and policy makers in the UK is not as strong as it might be". In doing this it will be important that we can continue to encourage culture change in institutions and work towards greater clarity and coherence in the relationship and interaction between academia, Government and professional bodies..

7. On the government side progress has also been made. Every government department now has a Chief Scientific Advisor and this presents an opportunity that did not used to exist. There do however remain some problems on the "pull side". Government, both national and regional, needs to get better at highlighting the opportunities and communicating the entry points for academic advice. There is sometimes a perception in academia that the policy process in government is difficult to penetrate or a closed shop.

8. Intergovernmental/academic exchange is a very beneficial process, however, mechanisms to facilitate and support this could be strengthened. Some academics, for example, find it difficult because of a lack of support by civil servants. Greater flexibility would also be beneficial. It would be easier for academics to work in government on a part-time basis in order for them to remain engaged in the university eg to supervise PhD students, and to keep their knowledge up to date. There also needs to be a clear and transparent mechanism for issues such conflict of interest, which can often be a concern for academics wishing to inform public policy

9. Programmes for civil servants to be seconded to universities, so that they have a better understanding of HE sector, would also be helpful. Most civil servants have the "student experience" point of view of universities (studying undergraduate/postgraduate courses), which provides at best a partial view of how modern universities work.

Beyond Science and Engineering

10. The importance of higher education informing public policy making is not limited to science and engineering. The British Academy report published in September 2008, *Punching our weight: the humanities and social sciences in public policy making*, found that researchers and policy makers agree that opportunities are being missed, because policy makers are not exploiting all that humanities and social science research offers. Universities UK agrees that more funding needs to be dedicated to supporting long-term knowledge development and longitudinal research that can offer a range of different solutions and perspectives to potential problems, as opposed to short-term research designed to meet immediate demands. We would also welcome moves by government departments to make their research priorities clearer and enter into timely dialogue with the academic community to ensure that they can work together effectively.

11. As highlighted in the joint Universities UK, RCUK and UNICO publication, *Impacts: successes from UK research,* investment in research improves the relative international and overall innovation performance of the UK economy. Significant innovations emerge from all research disciplines, including financial services, and arts and humanities research which underpins the UK's creative industries, and contributes £11.4 billion to the UK balance of trade.

Encouraging Interest in Science and Engineering

12. We endorse the Engineering Technology Board conclusion[171] that, if we are to increase interest in engineering and technology as a career in the long term, the government, employers, institutions, policy-makers, funders and other stakeholders need a greater recognition of the need for interventions designed to interest and enthuse young people—especially women—in engineering at a much younger age. Higher education institutions have a role to play in encouraging young people to study these subjects, but a coherent, strategic approach agreed by all stakeholders is required.

Skills Development

13. We agree with the Engineering Technology Board on the importance of upskilling the UK's workforce through training, development and lifelong learning, and that employers have a key role in developing their employees. Higher education institutions aim to continue working with employers nationally, regionally and locally to develop relationships and solutions to the challenges we face collectively.

[171] *Engineering UK,* 2008.

Regional

14. Universities UK welcome the contribution of the Technology Strategy Board to the development of policy relating to science and engineering, and the work of the Science & Innovation Councils in developing regional strategies. Going forward we consider this approach to be the right one—the development of regional strategies to implement national policy.

15. Given the reduction in the level of funding for Regional Development Agencies we would expect to see those structures that are already in place being utilised to take forward policy development and implementation. Regional Development Agencies add value for many regions in the area of knowledge transfer, particularly through their understanding of the company base, and can also play an important role in facilitating, encouraging and supporting relationships between universities and business. That is, embedding policy in practice.

16. Universities UK accepts the suggestion of the RCUK 2008 *Review of UK Physics* that, due to confusion over whether the government has any form of regional development policy in terms of where facilities should be located, DIUS and BERR should consult on a restatement of the Haldane Principle for the modern era. However, we consider that those best placed to make decisions on the allocation of research funds are those conducting research, as such decisions need to be made based on evidence and experience.

Research Assessment

17. The Research Assessment Exercise has been criticised for not encouraging universities to concentrate on their contribution to the development of public policy, and encouraged them instead to focus efforts on purely academic success. UUK was encouraged that the RAE2008, following the Roberts reforms, was designed to better recognise and reward user valued research. Moving forward with the development of the Research Excellence Framework we have an opportunity to enhance this. Universities UK has already been working with HEFCE to ensure that equal recognition of user valued research, which includes informing the development of policy, is built in to the assessment criteria. Most recently a high level workshop was held to address this question. The full outcomes can be found on HEFCE's website at http://www.hefce.ac.uk/research/ref/valued/.

January 2009

Memorandum 44

Submission from the Royal Society of Chemistry

Executive Summary

1. The RSC would like to highlight the following points to the Select Committee:
   - The RSC believes that the formation of a Department for Science could unintentionally damage attempts to implement the use of scientific evidence in all Government departments. The RSC encourages increased embedding of science throughout departments in order to support evidence-based policy-making.
   - The RSC is concerned that there is insufficient scientific capacity within Government departments to ensure that policies are developed on the basis of sound evidence. This could be improved by the recruitment of more scientifically-trained civil servants.
   - There is a lack of transparency in the use of evidence in policy formulation. A summary produced for each consultation describing how the evidence was used would make departments more accountable for their use of evidence in policy-making.
   - The RSC is concerned by recent waivers of the Haldane principle and believes that the Haldane principle must be preserved.
   - The RSC believes that regional issues must be served with relevant regional policy, but this must be monitored centrally to ensure consistency and quality control.
   - Mechanisms of engagement should be implemented to ensure that public opinion is proactively sought and that informed public opinion is gauged. Increasing transparency within the policy-making process should make it clearer that advice from scientists is independent from Government. This will allow Government to capitalise on the fact that scientists are trusted by the public and raise public confidence in policy-making.
   - Evidence-based policy-making requires a regular review of the evidence that contributed to policy formation.
   - The RSC is concerned that the current structure of House of Commons Select Committees marginalises the scrutiny of science.

Introduction

2. The RSC is the UK Professional Body for chemical scientists and an international Learned Society for advancing the chemical sciences. Supported by a network of over 46,000 members worldwide and an internationally acclaimed publishing business, our activities span education and training, conferences and science policy, and the promotion of the chemical sciences to the public.

3. This document represents the views of the RSC. The RSC's Royal Charter obliges it to serve the public interest by acting in an independent advisory capacity, and we are happy for this submission to be put into the public domain.

4. The document has been written from the perspective of the Royal Society of Chemistry.

Whether the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology put science and engineering at the heart of policy-making and whether there should be a Department for Science

5. Policy-making should be based on sound evidence and science and engineering play a vital role in contributing evidence. Although infrastructure such as the Cabinet Sub-Committee on Science and Innovation and the Council for Science and Technology exist to enable the use of science in policy-making, there are cases where policy-making is still based on opinion rather than on scientific evidence. This suggests that the current infrastructure is not effective at integrating science and engineering into policy making. It is difficult to gauge what weight an advisory board such as the Council for Science and Technology actually has on policy-making, but the RSC believes that the influence of the Council for Science and Technology and other advisory bodies may be restricted by the limited scientific capacity of Government departments.

6. The RSC believes that an unintended consequence of the formation of a Department for Science could be to damage attempts to integrate the use of scientific evidence in all Government departments. Formation of such a department risks marginalising science such that other departments do not feel that it is necessary to consider science when making policy decisions. The RSC encourages the further embedding of science throughout departments in order to support policy-making. DIUS already has sufficient remit to support policy-making relating to scientific research.

How Government formulates science and engineering policy (strengths and weaknesses of the current system)

7. With a view to the use of science in the formulation of policy, the RSC commends the appointment of Chief Scientific Advisers to some departments that use science-based policy-making and we would like to see the embedding of science extended to all Government departments. The appointment of Chief Scientific Advisers is one example that suggests that the Government does recognise the value of science and engineering in policy-making. However, evidence-based policy-making is not always implemented in practice. The RSC is concerned that there is insufficient scientific capacity within Government departments to ensure that relevant policies are developed on the basis of sound scientific evidence. Although advice may often be gathered from external sources it is necessary to have sufficient expertise within departments to act as an "intelligent customer".[172] Whilst the RSC supports training to raise the scientific literacy of civil servants and MPs, we believe that this is no replacement for the recruitment of more scientifically-trained civil servants. This would raise the scientific capacity of departments to integrate scientific knowledge in support of evidence-based policy-making.

8. With regard to the formulation of policy to support research in science and engineering there is a concern that Government is influencing research by applying pressure through the directed distribution of the research budget. This point will be discussed further in relation to the Haldane principle.

Whether the views of the science and engineering community are, or should be, central to the formulation of government policy, and how the success of any consultation is assessed

9. Science and engineering should be central to evidence-based policy-making and although there are structures in place to gather evidence it is not always clear whether evidence is used appropriately. Evidence gathering for consultations is transparent, but it is not always clear how this evidence is used in policy formulation. This makes it difficult to assess the effectiveness of the consultation process. The approach adopted by some Environment Agency consultations is to produce a document that outlines the responses received, including arguments as to why some comments are being rejected. We would like to see this model adopted across departments to make the decision making process more transparent. This would make departments more accountable for their use of evidence in policy-making.

[172] Royal Society of Chemistry submission to the House of Commons Science and Technology Committee on *Scientific Advice, Risk and Evidence: How Government handles them*. Paragraphs 7&8. Available from http://www.rsc.org/ScienceAndTechnology/Policy/Documents/2006/ScientificAdviceHandled.asp

The case for a regional science policy (versus national science policy) and whether the Haldane principle needs updating

10. The Government necessarily directs research at an overarching level by setting the research budget. However, the RSC agrees with the conclusion of the IUSS inquiry into the Science Budget Allocations in April 2008 that the Haldane principle has recently been compromised, for example the establishment of numerous cross research council initiatives that dictate how the budget is spent. The RSC is concerned by these breaches and believes that the Haldane principle, that scientists should determine how research funds are spent, must be preserved. In the case of fundamental research, scientists remain in the best position to determine the detailed research agenda through the established method of peer review.

11. The Haldane Principle is important to protect areas of research that are viewed to be of low strategic or economic value at a given time. Insulating research from these pressures will ensure that the UK retains a robust science base, which is important when prevailing scientific priorities change. The RSC is also aware that scientific activity is well served by diversity throughout the "supply chain" from fundamental research through to applied technologies. Maintaining this diversity will ensure a continued flow of scientific knowledge that benefits the economy. Applied areas of research must necessarily be driven by economic factors in addition to policy. This type of research therefore requires a different approach to fundamental research in order to promote diversity in science, but need not compromise the Haldane principle.

12. Evidence-based policy-making should be applied in all cases, throughout central Government, the devolved authorities and the Regional Development Agencies (RDAs).

13. There needs to be a balance struck between national and regional policy, in order to utilise regional strengths and promote development. The RSC believes that regional issues must be served with relevant regional policy, for example to support the needs of specific industry sectors, which tend to be regionally focussed. The RDAs have improved the implementation of regional policy. However, RDAs must be accountable for their policies and regional policy should be monitored centrally to ensure consistency and quality control. For example, currently in the South East of England chemical-based companies are not supported by explicit RDA science strategy, despite the fact that many of the UK's chemical-based companies are based in this region. This contrasts strongly with other regions, for example the Northwest, where initiatives such as Chemicals Northwest are in place to support these companies. Issues previously raised about scientific expertise in the civil service are also applicable to the RDAs and we are concerned that within the unelected RDAs there is no requirement to reach a basic level of scientific capacity. The RSC would like to see measures introduced to ensure a consistently high level of scientific literacy within RDAs, for example, with the introduction of Senior Scientific Advisers to mirror those in Government departments.

Engaging the public and increasing public confidence in science and engineering policy

14. A balance must be achieved between the use of evidence in policy-making and public opinion. Public opinion must be sought, especially regarding ethical issues, but policy-making should never be based on public opinion alone. Mechanisms of engagement should be implemented to ensure that public opinion is proactively sought and that informed public opinion is gauged, for example using citizen's juries. The role of public engagement in policy making is discussed further in the RSC response to the DIUS *A Vision for Science and Society* consultation.[173]

15. A recent DIUS/RCUK report suggested that scientists are generally trusted by the public.[174] However, this trust is compromised if scientists are perceived as being dependent on Government. The RSC suggests that increasing transparency within the decision making process should make it clearer that scientists who advise Government are acting with integrity and remain independent of Government. This should allow Government to capitalise on the fact that scientists are trusted by the public, thus raising public confidence in policy-making that involves science.

The role of GO-Science, DIUS and other Government departments, charities, learned societies, Regional Development Agencies, industry and other stakeholders in determining UK science and engineering policy

16. The way in which decisions are made is not transparent and it is difficult to establish the role of these different stakeholders in science policy-making. It often appears that policy-making attempts to reconcile extreme viewpoints, whilst neglecting the more moderate ground upheld by some stakeholders, including learned societies. The scientific capability of learned societies should be tapped and the contacts and honest broker status of learned societies such as the RSC should be capitalised upon by Government, for example by reference to their publications and for direction to experts in particular fields.

17. Improving both transparency in the decision making process and the scientific literacy of Government departments should enhance the contributions that various stakeholders are able to make in advising on science and engineering policy.

[173] Royal Society of Chemistry submission to DIUS on *A vision for Science and Society: a consultation on developing a new strategy for the UK*. Question 2: A society excited by and valuing science.
[174] *Public Attitudes to Science 2008*. Sections 3.84–3.91.

How government science and engineering policy should be scrutinised

18. Evidence-based policy-making requires a regular review of the evidence that contributed to policy formulation. This acknowledges the fact that scientific evidence changes over time, for example as techniques and understanding improve, and that policy must keep up-to-date with changes in the evidence base. The RSC is not aware of much, if any, *post hoc* examination of decisions taken. It is not practical for policy to be under continual review, but we recommend procedures are put in place for the regular review of all evidence-based policies, a point discussed further in the RSC submission on *Scientific Advice, Risk and Evidence*. This should not exclude the possibility that horizon scanning activities may identify policy areas that need to be reviewed, for example due to a rapid change in scientific opinion.

19. The RSC is most concerned that the current structure of House of Commons Select Committees marginalises the scrutiny of science. By incorporating science into the remit of the IUSS Select Committee there is a risk that scrutiny will only be applied to policy made by DIUS. For science to be effectively integrated throughout Government it is essential that a mechanism exists to scrutinise all science-based policy decisions, whatever their home department. We would prefer to see a more inclusive scrutiny mechanism that clearly applies to all departments, for example through the reinstatement of the House of Commons Science and Technology Select Committee, with a remit to scrutinise science and science-based policy across Government. This solution is probably easier and more efficient to implement than the alternative of scrutinising science-based policy by each of the separate committees, since it will allow a concentration of expertise supporting the committee. Whatever the mechanism in place for scrutiny it is important that this task is taken seriously and with commitment.

January 2009

Memorandum 45

Submission from the Wellcome Trust

1. The Wellcome Trust is the largest charity in the UK. It funds innovative biomedical research, in the UK and internationally, spending over £600 million each year to support the brightest scientists with the best ideas. The Wellcome Trust supports public debate about biomedical research and its impact on health and wellbeing.

2. Science has a crucial part to play in the development of government policy and we therefore welcome this inquiry. Because of the breadth of the committee's investigations, we have focused our response on a few cross-cutting issues, as follows:

- the need for a coordinated approach across government;
- ensuring the best available evidence informs policy-making at an early stage;
- recognising the impact of EU legislation on UK science policy-making;
- the importance of a strong research base to inform policy-making;
- the regulation of science; and
- the need to ensure public confidence in science policy.

The need for a Coordinated Approach across Government

3. Science in the UK has gone from strength to strength over the past five years. We welcome the Government's commitment to the excellence of the UK research base, signalled first in the *"Science and Innovation Investment Framework 2004–14"*, and recently reinforced through the 2008 Science and Innovation White Paper, *"Innovation Nation"*. We welcome the recent appointment of Lord Drayson as Minister of State for Science and Innovation, and particularly the recognition that this should become a Cabinet role. We are also pleased to see the continued development of the Office for Strategic Coordination of Health Research, which is beginning to shape a single health research strategy for the UK.

4. While science and innovation formally sits within the Department for Innovation, Universities and Skills (DIUS), it is important to recognise that many other departments also depend on science for their policies—including the Department for Business, Enterprise and Regulatory Reform (BERR); the Department of Health (DH); the Department for Children, Schools and Families (DCSF); the Department for Energy and Climate Change (DECC); the Department of Environment, Farming and Rural Affairs (Defra) and the Department for International Development (DFID). It is therefore crucial to ensure that there is a joined-up approach across Government. DIUS must work closely with all departments to ensure science is appropriately reflected in government priorities, and that government policy reflects the needs of science.

5. The Chief Scientific Advisers have an important role to play, working together to identify and explore cross-cutting issues from an early stage. We note, however, that there has recently been a significant increase in the number of agencies and committees providing advice on science, enterprise and education. We would encourage Government to ensure there is not unnecessary duplication; it may be helpful to clarify the remits of these different advisory bodies and to streamline their activities if appropriate.

Making sure the Best Available Evidence informs Policy-Making at an Early Stage

6. Government policy must be informed by the best available evidence. We therefore urge the Government to make the best possible use of the significant expertise of academia, learned societies, research funders and charities in the UK. The recent report by the Council for Science and Technology, for example, made a number of suggestions of ways to improve engagement between academia and policy-makers.[175]

7. The passage of the Human Fertilisation and Embryology Bill through parliament provides a particularly good demonstration of the benefits of consulting with the research community from an early stage. A partnership of stakeholders worked closely with the Department of Health and parliamentarians from both Houses to ensure that the provisions of the Bill were consistent and clear, and the legislation future-proofed so that it will be able to respond to as-yet-unanticipated scientific advances. We believe that the resulting Act will enable cutting-edge stem cell research in the UK to continue to flourish within a robust regulatory framework, while maintaining public confidence and support.

The Impact of EU Legislation on UK Science Policy Making

8. Legislation from Europe increasingly has the potential to impact on science in the UK—often in unintended ways. It is therefore vital to ensure that the process for seeking scientific advice from stakeholders is as comprehensive for the development of European legislation as it is for UK policy.

9. The EU Physical Agents (EMF) Directive provides an example of the potential risks when the full implications of European legislation are not recognised at an early stage. The Directive, as initially approved in 2004, would have seriously restricted the use of magnetic resonance imaging (MRI), both in the clinic and for research purposes. Thankfully, implementation of the Directive has now been postponed for four years, allowing time to review recent evidence and prepare amendments. We are pleased to see that the UK Government—having now recognised the concerns—continues to work to ensure that the revised Directive takes into account the concerns of the MRI community, including researchers.

10. It will also be important to ensure that revisions to the EU Directive 86/609 on the protection of animals used for scientific research—currently passing through the European legislative process—are both evidence-based and proportionate. The Directive must promote animal welfare, patient benefit, and UK scientific and economic competitiveness, without introducing unnecessary bureaucracy. The Government must continue to work with all stakeholders in a coordinated way to provide an informed response within a potentially tight timetable.

The Importance of Dual Support System in Creating a Strong Research Base to Inform Policy-Making

11. The best Government policy relies on—and is reflected by—a strong and sustainable research base. We therefore encourage the Government to continue its commitment to the dual support system in UK universities. This arrangement allows a diversity of funders—including charities, industry and overseas funders, in addition to the Research Councils—to support the best research. It is this system that has created the world-class research base demonstrated by the recent results of the 2008 Research Assessment Exercise.

12. Funding agencies can also play a role in helping to identify key areas of need and prioritise research questions, but should not be too directive. The Trust has developed funding structures that enable us to respond rapidly to the best ideas from the research community while providing the most appropriate form of support to take these ideas forward.

The regulation of science

13. The regulatory framework must encourage and facilitate research, maintaining an appropriate degree of checks and balances without introducing unnecessary and unhelpful bureaucracy. While clear regulations are needed to ensure that research is safe, undertaken in accordance with the highest ethical standards, and with appropriate protection for patients and the public, it is important to ensure that a proportionate approach is adopted, which reflects the degree of risk involved.

14. Researchers are increasingly expressing concern about the current regulatory burden which results in needless delays to research, particularly when undertaking clinical trials.[176] The various regulatory bodies are often poorly coordinated and regulations are inconsistent. There is a risk that regulation and governance

[175] *How academia and government can work together*, Council for Science and Technology, October 2008.
[176] See, for example, *Times* 14 January 2008 p.4; Stewart *et al*, BMJ 2008:337 1085-1087.

of research becomes so overburdensome that the UK loses its international scientific competitiveness. We recognise that in the area of medical science, National Institute of Health Research is introducing measures to tackle these concerns,[177] but would emphasise the unique role that policy makers in Whitehall have in ensuring a more streamlined approach within the Better Regulation agenda.

Engaging the public to ensure confidence in science policy

15. For society to benefit from scientific developments, the public must have confidence in the regulatory framework. Research commissioned by the Trust in 2006 found that there was strong support among the public in principle for the importance of biomedical research, but there was very little awareness of different models of research governance.[178]

16. We therefore welcome the recent moves by DIUS to develop a "Science and Society" strategy, and the vision of "a society excited by and valuing science". The public must not only be excited about science, but ideally should be able to engage in informed debate about scientific issues. This will also depend on a scientific workforce that embraces its engagement role with the public, and is willing to explore the potential benefits and risks of new developments. DIUS should continue to work to coordinate efforts to develop best practice to ensure that a scientifically literate public is able to have confidence in science policy.

January 2009

Memorandum 46

Submission from Sense About Science

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT

Summary

1. We welcome the growing interest in evidence-based policy making and initiatives to improve the use of scientific advice and evidence.

2. Some initiatives suggest a procedural approach to use of evidence; continued opportunistic or poor use of evidence in policy making show that a procedural approach can be a hollow substitution for more informed use of evidence and is open to manipulation in the face of political pressures.

3. Parliamentary scrutiny of science and evidence in decision making, on the other hand, *can* compete with political pressures—indeed, it is one.

4. While the office of the chief scientist introduces the potential for greater independence to science in government, parliamentary scrutiny of use of scientific evidence will underwrite the CSA's independence.

5. There are legitimate concerns about the cult of the expert and scientisation of politics. Parliamentary scrutiny of use of evidence can ensure that expertise is elevated in policy, but at the same time that it is subordinated to democratic accountability.

6. Government science and engineering policy is not the same as use of evidence in policy making but it is closely aligned and should rationally be scrutinised by the same committee.

7. The aim of public engagement is often not articulated and seems to be wide ranging.

8. The public is interested in scientific reasoning and the use of evidence. Sense About Science's experience is that citizens are empowered by scrutinising evidence and its use. This is democratic engagement rather than audience participation.

9. Since the Philips Report, scientific advice to Government has improved. Instances where advice is disregarded or the time of scientists apparently misused present a risk to this that should be reviewed by the Committee.

("The Committee" refers to the Science and Technology Committee, the IUSS Committee or proposed future incarnations.)

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[177] NIHR coordinated system for gaining NHS permission, National Institute for Health Research, April 2008.
[178] A literature review of research conducted on young people's attitudes to science education and biomedical science, Wellcome Trust, August 2006.

1. The Use of Science and Evidence in Policy Making

1.1 *Improving use of scientific advice and evidence in government*

We welcome the growing interest in evidence-based policy making and initiatives to improve the use of scientific advice and evidence.

1.1.1 Since 2004, Sense About Science has run a project to popularise understanding of peer review. We wrote to the Committee in January 2006 about "the importance of understanding and communicating the status of evidence in government advice and policy development".[179] We have promoted—and encouraged other organisations to promote—the need to understand the status of evidence being used at all stages of policy making. In particular, we noted that whether research had been published in a peer-reviewed scientific journal was often seen as a technicality rather than crucial to the judgement about how to use it.

1.1.2 The Government has taken steps to improve the coherence and accessibility of its analytical services.[180] There are some indications that there is growing recognition of peer review and the need to consider the status of evidence. We have noted initiatives to provide training, such as the Civil Servants Guide to Policy: Evidence Based Policy & Evaluation Workshop held March 2009.

1.1.3 We note, however, that the quality and peer review of evidence is still sometimes viewed as a technicality when it should form part of the critical evaluation of evidence, whether external or the result of commissioned research. We periodically review how the word "evidence" is used across government, in press releases, consultation documents and in Committee hearings. Scientific evidence is perhaps sometimes muddled with other evidence. DEFRA defines evidence: "We can say that *evidence is any information that Defra can use to turn its policy goals into something concrete, achievable and manageable."*[181] It goes on to explain different kinds of evidence with competence. However, some statements from Government indicate that this opening definition is confused with scientific evidence. We noted, for example, the responses of Home Office Minister Mr Vernon Coaker to questions about the Policing and Crime Bill in the House of Commons General Committee, suggesting that publication of evidence was a technicality.[182]

1.2 *The problem of a procedural approach*

Efforts by the Government to improve use of evidence have tended be quite procedural. This is understandable in view of the limited tools available to improve decision making in a direct sense. However, the first problem is that ministers and civil servants would be unlikely ever to develop a procedure or guidelines that insulate decisions from poor use of scientific evidence or expertise. In 2005, the Chief Scientific Adviser consulted and updated the Guidelines on Scientific Analysis in Policy Making 2000. Questions such as "How should we deal with 'breaking news' where the new evidence might be radically different?" showed the limitations of being able to establish procedures that would deliver anything like the level of judgement and accountability that will often be required in the use of scientific advice in policy making.

1.2.1 The second problem is that continued opportunistic or poor use of evidence in policy making, for example the tendency to think in terms of commissioning evidence rather than commissioning research, show that a procedural approach can be a hollow substitution for more informed use of evidence and is open to manipulation in the face of political pressures. Innovating ways around procedures has a long history in policy making!

2. Parliamentary Scrutiny of Science and Evidence in Government

2.1 It seems reasonable to conclude that parliamentary scrutiny on the other hand, *can* compete with political pressures—indeed, it is one. The Committee has succeeded in correcting misleading presentation of evidence and making significant correction to scientific mistakes. The current remit of the IUSS committee should urgently be reviewed and consideration given to establishing a committee where there is no risk of future sidelining of its cross departmental scrutiny of the use of science and evidence in government. We also note that the current IUSS committee has a collective memory inherited from the SciTech committee and suspect that the continued scrutiny of scientific evidence in decision making could be lost with changes of personnel in the future.

[179] Inquiry into Scientific Advice, Risk and Evidence: How the Government Handles Them, Ev 116.
[180] Analysis and Use of Evidence: Research and Analysis in Government, 2008 PU565.
[181] Evidence-Based Policy Making, www.defra.gov.uk
[182] CM200809/CMpublic/policing/090129 Q195–197.

2.2 *Accountability for the CSA and departmental chief scientists*

The Committee has welcomed and reviewed the work of the CSA and departmental chief scientists; we welcome the Committee's stated plans to do more of this and to continue to review the cross departmental impact. While the office of the chief scientist introduces the potential for greater independence to science in government, parliamentary scrutiny of use of scientific evidence will underwrite the CSA's independence in a fundamental way.

2.3 *Democratic accountability of expertise*

There are legitimate concerns about the cult of the expert and scientisation of politics. Nor should we lose sight of the risk that scientific evidence may be seen as a magic policy potion. Rub it on and people who object to your idea won't have a leg to stand on! It is easy to see how policy makers become attracted to the idea that the evidence itself wrote the policy. With the proliferation of scientific advisory committees, there can be confusion about who is actually accountable for policy decisions. Parliamentary scrutiny of use of evidence can ensure that expertise is elevated in policy, but at the same time that it does not supplant policy responsibilities (and so become overly politicised) and that expertise is subordinated to democratic accountability.

2.4 *Scrutiny of science and engineering policy*

Government science and engineering policy encompasses research funding and skills, which is not the same as use of evidence in policy making but it is closely aligned and should rationally be scrutinised by the same committee.

3. Engaging the Public in Science and Engineering Policy

3.1 *The aim of public engagement is often not articulated and seems to be wide ranging*

Public engagement includes the promotion of science in schools and science careers, "science, wow!" activities, which possibly are assumed to contribute to acceptance of research and new technologies but that is unclear, and consultative government, which might have a variety of intentions. On what terms would this be scrutinised? As the Committee is aware, DIUS is currently looking at ways to evaluate public engagement activities and must consider whether participation is for its own sake or for some other purpose.

3.2 The public is interested in scientific reasoning and the use of evidence. In our experience, people and organisations who interact with the public are asking for help about a wide range of science-related subjects, to sort through scare and hype stories, to determine which products and practices are effective or what might be a scam, and to come to conclusions about the reliability of scientific claims and assess controversies. These are the kinds of questions we are asked by the public.

Help me get to grips with it

- Is this something parents should be worried about? (midwife responding to news story on plasticisers in baby's bottles).
- Can I get something from the scientists about this? (Town councillor on WiFi radiation; AIDS meals on wheels group about miracle diets and superfoods stories).
- Is this another scare story? (Women's magazine on skin absorption of make-up; allotment holders on stories about growing food near main roads).
- Is this something we should warn people about? (Jobs agency hosting ads for clinical trials after Northwick Park).
- Do scientists do any work on this kind of thing? (PTA on option to site wind turbine on school).
- Is it the scientists or the companies who say it's safe? (Parish council and local newspaper on mobile phone masts).

How much do we know?

- What do the scientists actually know about this? (Local residents association on chemical residues in brown-field site; gym instructor on steroid use).
- Can I find out what tests have been done? (TV celebrity on homeopathy, education writer on WiFi, mental health group on St John's Wort).
- How sure are they that they're right? (Most common call on vaccine safety).

Balance of scientific opinion

— Do these people represent the majority of scientific opinion? (UK's top advertising company responding to TV programme on global warming; members of the public with the same question; youth club on the effects of illicit drugs following a Newsnight programme).

— How are the scientists split on this? (Local horticultural society on GM "superweeds" story, parenting magazine on 5-in-1 vaccine, a County Council on fluoride).

Legitimacy

— Is it a proper study? (Self-help breast cancer group on whether stories about underarm deodorants causing cancer are true, teachers on reports of "brain gym" success in schools).

— How can I tell whether it's proper research? (Patients responding to stories about full-body scans preventing disease; carers responding to story that NICE does not approve Alzheimer's drugs for prescription; community café on the effects on children of colourings in foods).

— It says here it's from scientific research—how can I tell whether that's true? (Most common question about internet adverts for health cures that people send to us).

— Are they only listening to one group of scientists? (Conservation group on fishing quota decision).

— Have they talked to the scientists? (Parents on decision to allow WiFi in schools).

— How should we explain to helpline callers what kind of studies these are? (Neurological diseases societies on flurry of unfounded claims in media).

3.3 There seems to be a tendency in science and policy engagement to be coy about the existence of debates and misconceptions, making only euphemistic reference to them. Unless there is clear response to what people are actually talking and deciding about, they don't tend to notice or use it. We are often asked questions by civic and community groups about the chain of reasoning and what is supported by evidence about subjects on which long reports and consultation documents are available. It seems that if people (including journalists and other opinion formers) can't see direct links to the debates and claims in public life, they just don't see these materials. Or perhaps put another way, what people are looking for is not a long route to understanding but some short cuts to help them sift and decide where their concerns lie. A review of public discussion at the outset of science-related policy developments would also avoid situations where only the views of hostile groups are given consideration.

3.4 Sense About Science receives many communications from scientists and from members of the public who are frustrated about misleading or poor use of evidence in policy but feel helpless about it. One of the questions we are most frequently asked is "Should I write to my MP? What could she do?" Sense About Science's experience is that citizens are empowered by scrutinising evidence and its use. This is democratic engagement rather than audience participation. We would like the committee to look at how far into the public consciousness it work is reaching and what potential there is to engage people in the kinds of questions that the committee is concerned with on the use of scientific evidence in policy. We would like to write to you further on this issue.

3.5 Sense About Science works with over 3,000 supportive scientists, to promote good science and evidence for the public. Many of them have served on government advisory committees and contributed to consultations in the development of specific policies. Often, the time and energy they have contributed has been substantial and this is often over and above their "day job" as scientists. We have become aware of a degree of cynicism among scientists about the value of doing this kind of work. It has not been helped by cases where scientific advice has been sought by the Government but then apparently disregarded, as happened recently with the recommendations of the Advisory Council on the Misuse of Drugs.[183] Sense About Science is very worried about this, from the perspective of the public interest in good science. We feel that the Government should recognise the risk of undoing some of the positive developments in the use of science advice, and the willingness of the scientific community to provide it, since the publication of the Philips Report in 2000.[184] Some problems may arise from failure to identify the role that scientific advice will play in the development of a specific policy. It may also be exacerbated by instances when a political decision is made to disregard evidence but this is not explained.

3.6 The Committee has previously made recommendations aimed at providing "an active network of scientific support for Government"[185] We see an urgent need to review the way that the contribution of the scientific community is used and to help the Government to recognise the risks associated with the apparent misuse of scientists' time and the implications that this has for seeking advice in the future. In our experience,

[183] ACMD: Cannabis: Classification and Public Health, 2008.
[184] The BSE Inquiry Report, 2000.
[185] Science and Technology Committee: Scientific Advice, Risk and Evidence Based Policy Making, 2006 HC99-1.

the scientific community has greatly appreciated the work of the SciTech and IUSS committees, and in particular the opportunity to raise problems at the Bill stage of policy making and outside of the framework dictated by government consultations.

February 2009

Memorandum 47

Submission from the Food Standards Agency

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

The Food Standards Agency was established in 2000 in a climate of public loss of confidence in government policy and advice on food issues, following the BSE crisis. The FSA was established as a non-Ministerial UK Government Department at arms' length from Government, headed by a Chair and a Board, who are appointed to act in the public interest. The FSA reports to Parliament and to the devolved administrations in Scotland Wales and Northern Ireland through Health Ministers. The FSA has its own budget, negotiated directly with the Treasury, of which some £20 million is allocated to research. The FSA is empowered to publish its advice to government.

The primary aim of the FSA is to "protect public health from risks which may arise in connection with the consumption of food and otherwise protect the interests of consumers in relation to food." (Food Standards Act 1999).

The Agency is responsible for:

— assessing, managing and communicating risk in relation to food; and

— developing and implementing policy in the UK on issues affecting safety, composition, labelling and nutritional value of food.

In all of this work to deliver our vision of "safe food and healthy eating for all", we are guided by a set of core values:

— putting the consumer first;

— openness and independence;

— science and evidence based.

The FSA's independence and open and transparent policy making processes are key to our success in maintaining public confidence. Good science and evidence are at the heart of the FSA's work

THE GOVERNANCE OF SCIENCE

Science is fundamental to helping the Agency meet its strategic objectives to make food and drink safer and healthy eating easier. It provides the evidence base on which the assessment of risk is based. The FSA has given priority to developing robust governance of science processes within the organisation to ensure that scientific evidence is being sought, obtained, interpreted, used and communicated appropriately and effectively. The key components of the FSA's science governance are:

Scientific expertise: 46% of the FSA staff have a background in science and of these more than 67% have postgraduate qualifications. The FSA's Chief Scientist is the Head of Profession. This internal expertise not only helps ensure that the research and surveillance programmes undertaken are sound but also helps to frame the questions at the beginning of the risk assessment process to take into account what consumers will want to know. The FSA establishes independent ad hoc working groups to provide advice on specific issues. Individual experts evaluate research proposals and review programmes. Where appropriate, our research is peer reviewed.

Scientific Advisory Committees (SACs): The FSA is advised by ten Scientific Advisory Committees, including a recently formed Social Science Research Committee, made up of approximately 140 independent and eminent scientists. The FSA has also established an Advisory Committee on Consumer Engagement to provide the FSA Board with an independent assessment of the extent to which the FSA is engaging effectively with consumers and to offer advice to FSA staff on how best to engage consumers on particular issues.

General Advisory Committee on Science (GACS): This overarching Committee (whose membership comprises the chairs of each of the SACs) is newly established under the chairmanship of Professor Colin Blakemore. The overall purpose of GACS is to provide independent challenge and advice to the Chief Scientist and to the FSA Board on the Agency's governance and use of science.

Science Checklist: A tool that relates primarily to the risk assessment process that makes explicit the points to be considered by FSA staff and by the SACs in the preparation of papers on science-related issues for consideration by the FSA Board. The SACs have also developed Good Practice Guidelines which complement the checklist and ensure that the operation of the SACs is consistent with the remit and values of the FSA.

Horizon scanning: Both FSA staff and the SACs have an important part to play in the process of identifying the potential impact of emerging science and technologies on food safety and consumer health issues. In addition, GACS has a role in identifying new issues and potential gaps as well as advising on sources of advice that cut across the remits of the individual SACs.

FSA Chief Scientist: In recent years the role of the Chief Scientist has been strengthened. The Chief Scientist has the responsibility of ensuring that the FSA's science governance processes are used and that the SACs have been fully consulted.

As a result of the FSA's reliance on robust science governance, when the FSA Board meets in public to make decisions on food policy, it is reassured that the information before it is the best available scientific evidence and advice on the issue. In addition, the relevant Chairs of the SACs join FSA Board at the table during Open meetings when issues within their remits are being discussed and the FSA's Chief Scientist always sits at the board table to provide advice and assurance to the Board on scientific issues.

The FSA's Chief Scientist publishes an Annual Report, which, as well as providing a public account of the FSA's scientific activities, provides an opportunity to summarise in a single, coherent document the many and varied ways in which the FSA uses and promotes science and contributes to scientific progress. The Chief Scientist also publishes a Research Report annually. The FSA's Chief Scientist is a member of the network of Chief Scientific Advisors in Government led by Professor John Beddington.

How we handle and deliver science?

The FSA's practical experience has led us to adopt an integrated model of risk assessment, management and communication where two way communication with stakeholders and consumers takes place throughout the policy process. (see annex)

Much of the FSA's reputation depends on the way we handle uncertainty. Science is fundamental to reducing uncertainty and providing consumers with the clearest possible advice. The weight of evidence is usually sufficient to enable SACs to so define risks and uncertainties that the FSA Board can make a judgement about managing the risk. However, sometimes science is unable to offer that assurance. Under those circumstances we acknowledge that uncertainty, whilst taking proportionate action. In reaching decisions on risk management, the Board considers wider economic, social and environmental influences, including the attitudes and risk appetites of the public, the costs and benefits of different options, and the practicalities of delivery and enforcement.

Communication is integral throughout the process, being open with what we know and when we know, if there is a potential risk to public health, even when there are uncertainties.

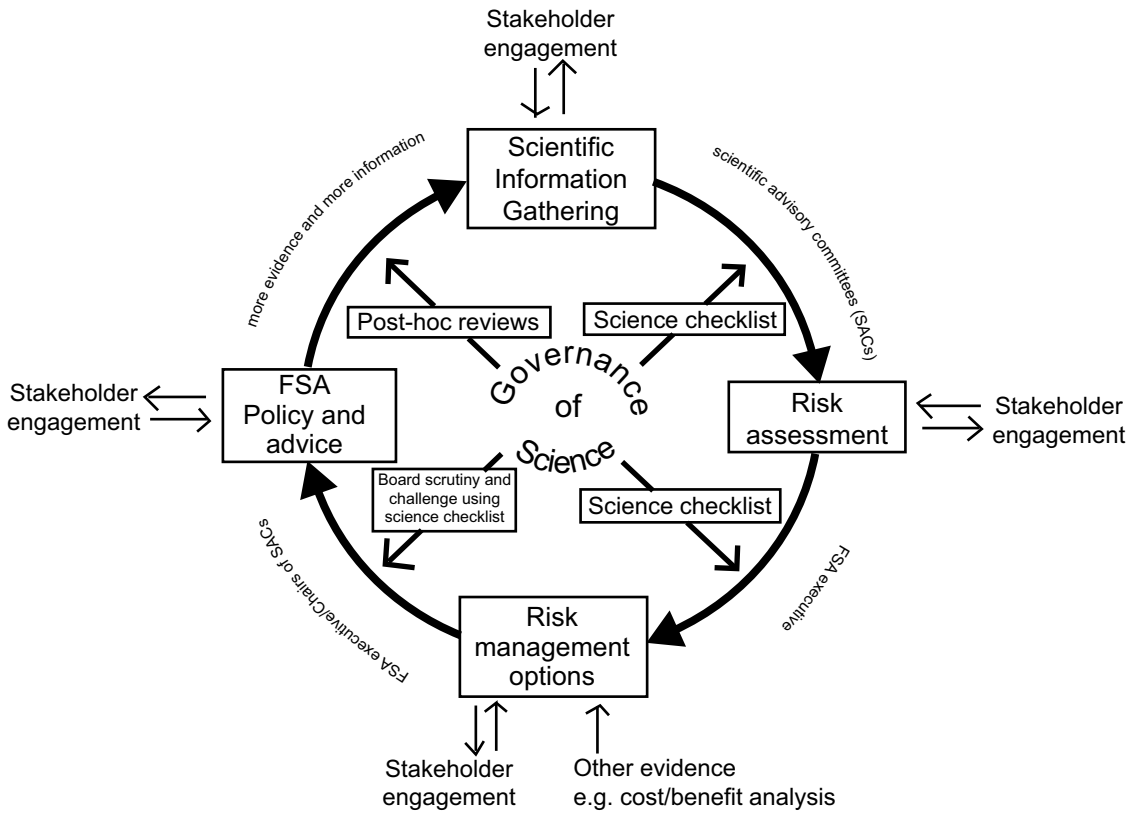
We aim to communicate proactively with the public on science issues. The FSA website has won awards for its accessibility and the Chief Scientist's blog is widely quoted in the media, as well as followed online. However, the FSA is always looking to find more, and better, ways to engage the public in dialogue about science.

Weblink to Chief Scientists' Annual Report: http://www.food.gov.uk/multimedia/pdfs/publication/chiefscientist0908.pdf

March 2009

Annex

FSA's INTEGRATED APPROACH TO RISK ASSESSMENT, RISK MANAGEMENT AND COMMUNICATION



Memorandum 48

Supplementary submission from the Council for Science and Technology

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

FURTHER NOTE FROM THE COUNCIL FOR SCIENCE AND TECHNOLOGY

The Committee asked for further advice on how the CST's report *Strategic decision making for technology policy* had been implemented.

Our report set out a priority-setting framework for making strategic choices, and used that methodology to identify six key technology areas which extra resource from Government would deliver returns to the UK within a five-year timeframe,[186] together with four further platform or enabling technologies.[187]

This note covers implementation of the overall framework and support for the individual technologies. We are pleased to see that, in almost all cases, Government and in particular the Technology Strategy Board, is taking forward our recommendations. Nevertheless, we shall want to return in the future to our original recommendations and carry out a more detailed assessment.

CST's PRIORITY-SETTING FRAMEWORK

TSB have provided us with the criteria they use to decide where to focus resources, and these are closely aligned with our own. They include UK capability, market opportunity, whether the idea is "ready" and what difference TSB intervention would make, as well as against other elements of the CST framework such as societal implications, risks, and why Government intervention is needed.

[186] These are: Carbon Capture and Storage; Disaster Mitigation Technologies; Low Carbon Distribution Networks for Electricity Supply; Medical Devices; E-Health; and Plastic Electronics.
[187] These are: Bandwidth Telecommunications; Cell and Tissue Therapies; Pervasive Systems; and Simulation and Modelling.

TSB also takes a challenge-based approach, focusing major societal challenges and identifying which technologies or combination of technologies can provide the best solution.

CST's Key Technology Areas

Carbon Capture and Storage (CCS)

We are pleased that Government has a competition underway for public support for a CCS demonstration project, which was our main recommendation.

TSB supports CCS through a £15 millions competition for research, development and demonstration in Carbon Abatement Technologies, in partnership with DECC and the Northern Way.

Government also provides support for the Energy Technologies Institute, which we understand is active in this area and that over the next year is looking to create a portfolio of CCS projects.

Disaster Mitigation

TSB has a £10 millions competition, launched in 2008, on *Gathering data in complex environments*. While we are disappointed there are no plans for a *Disaster Resilience* Knowledge Transfer Network, as we recommended, we note TSB is proposing to establish special interest groups and we would encourage them to address the need to share expertise in this way.

Low Carbon Distribution Networks

Investment to reinvigorate the National Grid is essential to ensure that new, low carbon renewable technologies can be brought on-stream and that energy efficient utilisation can be accommodated.

The Council will be assessing progress in this whole area as part of its current project, commissioned by Government, on the National Infrastructure. In particular CST is looking at how various key components—energy, transport, communications, water—interact. We shall therefore be returning to this issue as part of that project, and will be reporting in the summer.

Medical Devices

We are aware of a number of important initiatives, including the TSB's £15 millions *Technologies for health* competition in 2007 covering diagnostics and genetic screening, and joint initiatives such as the Healthcare Technology Co-operatives bringing together business, NHS, academic groups and patients to assess the feasibility of new innovations in clinical healthcare technologies.

We are pleased to hear that procurement is being used as a way of driving up innovative capacity in business, both through a pilot Small Business Research Initiative (SBRI) between the TSB and Department of Health and through the TSB's Innovation Platforms. CST has been an early champion of the SBRI approach, which provides 100% funding for projects leading to future procurement opportunities.

E-Health

We are pleased this is being addressed through the TSB's *Assisted Living* Innovation Platform which was launched in November 2007 jointly between TSB, DH, and two Research Councils, EPSRC and ESRC. It is too early to assess outcomes.

Plastic Electronics

We are pleased to hear that the TSB has produced a strategy covering *Electronics, Photonics and Electrical Systems* setting out areas where UK has a world lead. We welcome their acting as a focal point for the analysis of the Plastic Electronics value chain in the UK, as we recommended. It will be important for TSB to address quickly the challenges of constructing a value chain analysis that retains wealth creation opportunities for the UK, as well as bringing together the major players to ensure exploitation of market and product opportunities in the UK.

We recognise TSB support—over £38 millions via collaborative R&D projects, the PETeC centre, and the Displays and Lighting KTN—and that the IUSS Committee itself has taken evidence in this area. All this underlines the importance of Plastic Electronics and the need for quick and effective actions to capture value for the UK.

CST's Platform/enabling Technologies

We are pleased to see that TSB has been supporting these technology areas, through for example Photonics21 (for Bandwidth telecommunications), Pervasive Computing (for Pervasive systems) and their £10 millions Cell Therapy competition in November 2007. We await sight of their Biosciences Strategy which we understand is to be launched shortly.

March 2009

Memorandum 49

Supplementary submission from Unite the Union

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

This response is submitted by Unite the Union, the UK's largest trade union with 2 million members across the private and public sectors. The union's members work in a range of sectors including financial services, print, media, construction, local government, education, health, not for profit and manufacturing which makes up a substantial component of our overall membership.

Unite is the main union representing Higher Education scientific technicians and academic related staff in the UK and Republic of Ireland. This, along with its considerable membership in manufacturing, makes it a major stakeholder in all decisions around science, technology and engineering related policy and funding.

Introductory Comments

1.1 Unite welcomes the opportunity to provide input into this debate and to provide additional oral evidence if necessary.

1.2 Our response to the Governments, and more particularly Lord Drayson's comments of 4 February 2009, "Has the time come for the UK—as part of a clear economic strategy—to make choices about the balance of investment in science and innovation to favour those areas in which the UK has clear competitive advantage?", is as follows.

1.3 Unite sees a danger in concentrating on cutting edge innovation, as it perceives is implied by such comments, as it may mean traditional areas of manufacturing in which Unite operates would receive less Government R & D support. This, during recessionary times when existing UK manufacturing enterprises need all the support they can get to recapture their competitive edge through the development of more efficient and effective technologies. Technologies for which UK organisations not only hold the intellectual property rights, but from which they can in turn commission, utilising existing upgraded local assets and trained staff to produce, green desirable products for global markets.

1.4 Unite would like to see the Government adopt an approach similar to that of the French where they greatly value their existing manufacturing industries. An approach that demonstrates the UK Government truly does put science and engineering at the heart of government policy, ensuring not only the survival, but healthy growth of existing UK endeavours. One that would ensure announcements such as Reading University's closure of its physics department in 2010, resulting from the trend towards marketisation of education, are not only reversed but never repeated and are replaced by announcements of the expansion of such facilities.

Key Issues Which the Committee Seeks to Address

2.1 *What form a debate or consultation about the question should take and who should lead it?*

The debate should be conducted along existing lines and must continue to ensure input from key stakeholders such as workers, from both from R & D and manufacturing organisations/firms, along with their trade union representatives. However, research councils and trade associations such as Institute of Electrical Engineers (IEE), Institute of Chemical Engineers (IChemie) should also be consulted.

2.2 *Whether such a policy is desirable or necessary?*

Such a policy is not only desirable, but essential, if the UK is to pull itself out of the recession and approach the future in a strategic way so as to develop, through targeted R & D, a sustainable balanced economy built around our existing/enhanced infrastructure and skills base. However, it is where the policy is aimed that is most important. Too much emphasis on blue sky research opens up a potential rift with existing industrial sectors that, if left out, will result in other international competitors taking up those industrial and research opportunities with a threat to UK Ltd jobs and industrial sectors.

2.3 *What the potential implications of such a policy are for UK science and engineering, higher education, industry and the economy as a whole?*

The potential implications of getting such a policy right are massive as proper policy will ensure research institutions are funded appropriately so as to focus on, not only fundamental science, but also applied science which assists companies, particularly in the labour intensive manufacturing sectors, to grow and diversify in order to satisfy identified demand. An entire focus on cutting edge innovation, at the expense of identifying innovative technologies for existing enterprises, lessens our ability to achieve a balanced economy and puts at risk existing enterprises and the jobs and skills they provide which require substantial R & D in order to maintain their competitive edge and ability to diversify.

2.4 *Were such a policy pursued, which research sectors are most likely to benefit and which are most likely to lose?*

Policies which only seek to focus research resources on so called priority fields, at the expense of enhancing existing manufacturing resources through applied research to develop/refine processes and products for existing and new markets, would not only result in a decline in these research fields but would also result in an even greater/corresponding decline in the often labour intensive and important manufacturing sector. Whilst the beneficiaries may well be research sectors like Medical Research, such an approach would ultimately result in a less diversified, less stable economy.

CONCLUSION/RECOMMENDATIONS

3.1.1 Unite sees the real issue here as not necessarily one of picking winners, although some element of this may be necessary, but one which supports and enhances existing enterprise, and the jobs it provides/creates, through R & D that assists it to maintain a competitive advantage to meet the demands of both existing and new global markets. Such an all encompassing approach seeks to develop a balanced economy which doesn't throw the old out for the new, but which embraces science and engineering wholeheartedly in government policy to ensure our progression out of recession and into sustainable economic growth.

3.1.2 Unite sees this approach as not only adopting the five key principles of science policy addressed by Lord Drayson in his speech of 4 February 2009, along with his three criteria for identifying those areas for greatest focus, but one which adopts a fourth and critical criteria which seeks to utilise and upgrade existing local assets and trained staff to produce green desirable products for global markets. In the future every job may be audited as to whether it is a "green" job. That does not mean existing occupations are thrown away but rather the investment in new greener technologies are also used to uplift and enhance traditional skill mixes in a modern environment.

April 2009

Memorandum 50

Submission from the National Physical Laboratory (NPL)

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

- NPL believes that such a policy is both necessary and desirable as it ensures a transparency and scrutiny of investment of Government funding;
- This decision-making process is consistent with "industrial activism", is well understood by NPL, and has been implemented to direct our own funding for a number of years;
- NPL suggests the critical issue that Government must debate is the required outcome of this investment in science—it is vital that demonstrable evidence is provided to support claims of economic and social impact; and
- NPL would support an increase in funding allocated to near-market solutions to ensure innovations make it over the final large hurdles to exploitation.

The National Physical Laboratory (NPL) is one of the UK's leading science and research facilities. It is a world-leading centre of excellence in developing and applying the most accurate standards, science and technology. NPL contains a National Measurement Institute developing and maintaining the national measurement standards, and supporting infrastructures required to ensure quality of life and economic benefit. NPL is DIUS's largest directly-owned science asset with world-leading experts in important areas such as materials, the environment, healthcare, advanced manufacturing and knowledge transfer that enable UK businesses to stay internationally competitive.

To deliver this role NPL, via the National Measurement System, has a limited budget to spend. Measurement can cover a huge range of topics, so for many years NPL has found itself in the position to make decisions about which research areas to invest in. NPL has a sophisticated process to formulate

programmes and analyse them against potential impact, future and current market requirements and sustaining world-leading positions. NPL use this to inform our advisory panels of areas of research and potential outcomes to aid the decision making process. We find this process useful to help us challenge the reason for investment and believe this makes our choices more robust as a consequence.

The consultation must address the issue of desired outcome for the science; which will in turn dictate the balance of investment between scientific discovery and the translation of new science for economic and social benefit. Currently the UK is seen as leader in science research but the government investment in translational R&D is much less than our international competitors. This clearly cannot be simply left to the market place. If the UK wishes to invest in innovation to deliver economic and social benefit then it will need to do more to see it through the expensive final stages of developing products to reach the market. Clear policy on the types and balance of investment and expected outcomes would be welcome.

NPL has a small fund (Measurement of Innovators) which is designed to help SMEs with near market products make the final steps of product demonstration or innovation through measurement by making use of Government funded assets (both facilities and people). Over the past four years we have helped over 400 companies and the scheme is constantly oversubscribed. This is money well spent; the first 200 participants of the scheme saw a total annual increase in sales and profits of £10.3 million.

World-leading scientific teams usually make ground-breaking scientific discoveries. These teams also attract and support high value-added businesses to the UK. So the UK needs world-leading science teams both to lead scientific discovery and to deliver economic and social benefit to the UK. To be world-leading requires knowledge of, and advantage, over competing teams elsewhere. If the UK is to support such scientific teams, it requires focusing investment on them, which inevitably means less support elsewhere. This has a positive effect in creating centres of excellence attracting clusters of innovative companies, and inward investment to the UK. It also strengthens the UK science base and aligns skills with economic opportunity or national challenges.

NPL broadly supports the focus on cross-disciplinary areas such as the low carbon economy, data security, environmental change, lifelong health, and advanced manufacturing (including nanotechnology) already identified by the Royal Society, Research Councils and other bodies as important; these are areas where the UK can effectively exploit its competitive advantage. To this list, we would also add measurement science that underpins many of the other areas and provides the rigorous scientific infrastructure to support cost-effective regulation and technical innovation. It is important to provide clear evidence of the impact of the proposed work; thus, for example, DIUS economists have shown that a £6 million investment in the National Measurement System gives a ROI of £410 million to GDP. We recognise that the recession provides a particularly challenging environment and believe that targeted funding is also required to preserve the key science and technology skills needed to recover effectively.

April 2009

Memorandum 51

Supplementary submission from the UK Computing Research Committee (UKCRC)

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

Executive Summary

1. The UK Computing Research Committee (UKCRC), an Expert Panel of the British Computer Society, the Institution of Engineering and Technology and the Council of Professors and Heads of Computing, was formed in November 2000 as a policy committee for computing research in the UK. Its members are leading computing researchers from UK academia and industry. Our evidence reflects the experience of researchers who each have an established international reputation in computing.

2. Our evidence thus covers UK research in computing, which is internationally strong and vigorous, and a major national asset.

3. Leading members of the scientific community have already identified some long-term ambitious goals which will have substantial societal and economic impact. UKCRC has been an early contributor in this area with our work on the UK Grand Challenges in Computing (http://www.ukcrc.org.uk/grand_challenges/index.cfm).

4. An overt focus on funding research which brings short-term competitive advantage to the UK is likely to make the UK much less attractive as an international partner. Inability to collaborate internationally will make our research more expensive and time-consuming; failure to submit results to international scrutiny will reduce the quality and reliability of the research; and these issues could seriously impact or delay any hoped-for competitive advantage.

5. The problems of the world today (climate, finances, depletion of resources, terrorism) are of a kind that are addressed by our most basic branches of "big" science (biology, physics, computer science). In all these areas, pursuit of national competitive advantage is widely recognised to be the wrong approach.

6. A selective focus in research funding is bound to have unforeseen consequences and needs very careful consideration. The UKCRC is keen to engage in the discussion.

Introduction

7. The UK has always been exceptionally strong in computing research: the first modern computer was developed at Manchester University and ran its first program in June 1948; since that time, the UK has played a part in almost all the scientific and engineering advances in computing. Computer systems have transformed modern life but the world is still in the early stages of discovering, inventing and exploiting their full potential. UK computing research remains world-class,[188] and is a national asset that enhances the UK's international prestige, attracts inwards investment, and supports innovation for wealth creation and improved quality of life.

What form of debate or consultation

8. Whilst recognising the imperative for consideration of such a policy, UKCRC fears that it will inevitably lead to a decline in the UK's standing in many areas of science and technology. The debate/consultation on this should be led by an independent body; one obvious candidate might be a combination of the Academies (Royal Society, Royal Academy of Engineering and Academy of Medical Sciences). Any decision to withdraw from an area of research should be made only after the Academies have given their best estimates of the long-term consequences.

Whether such a policy is desirable or necessary

9. Where the UK really falls behind its major competitors is in getting small start-ups to develop into major world players. The problem is therefore not at the level of the research councils but more to do with the enterprise environment in the UK. It is not clear that a policy that prioritises research in relation to the country's economic and industry needs would be desirable or necessary.

10. Failure to participate fully in international research will make it much less likely that our scientists and industrialists will give early recognition to, and be capable of rapid exploitation of, new results obtained by the best scientists in the rest of the world. As a consequence, concentration on local advantage could actually reduce our overall innovation.

Potential implications of such a policy

11. The success of UK commerce and industry relies on the ability to exploit both UK research and results from elsewhere in the world. This requires a world-class research base in the UK that is capable of translating the results into the UK industrial context. A selective policy of research funding would inevitably lead to loss of capacity in some areas and would thus threaten our ability to exploit such work.

Winners and Losers

12. Computing research in the UK is a major contributor to the economy: there are many examples, but one of the most prominent is ARM with its dominance in the mobile telephony area.

13. Computer Science has become a vital component of all other sciences and has made possible new natural sciences (genomics, computational chemistry, climate modelling . . .).

14. Such considerations suggest that Computer Science, and the broader ICT community, are likely to be winners from a selective policy. However, we live in a complex research eco-system and such a policy could have unforeseen and undesirable consequences in the long-term. UKCRC is very keen to assist the Government in achieving its aspirations without harm to the science base.

15. Any decision to withdraw from one area of scientific research in which our industry is not now effectively competing will, of course, ensure that our failure to compete will be permanent. Since competitive advantage cycles among nations and among industries, within a short time there is the danger that the UK will become uncompetitive in all fields.

April 2009

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[188] This has been confirmed by successive EPSRC International Reviews, the latest of which reported in 2007, and the 2008 RAE outcomes.

Memorandum 52

Supplementary submission from the Royal Aeronautical Society

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

1. The UK aerospace industry has been one of the unequivocal successes of UK manufacturing. A consistently high investment in research and development, both public and private, has been translated into an impressive export record. UK-based companies produce world-class goods and services for the civil and defence markets. The UK is especially well represented in civil aero structures (especially civil aircraft wings), aero-engines, helicopters, complex weapons, communication satellites and a comprehensive range of equipment and electronic systems. While much of this is designed for incorporation into international programmes, the UK retains a high-level of systems integration and associated systems engineering competence. This is high value employment, drawing upon the skills and competence of the UK scientific and engineering base.

2. UK aerospace has been well supported by successive governments. Repayable launch investment has funded UK developments in civil aircraft wings and aero engines. Investment in technology acquisition, notably in composite materials, has helped UK industry to retain its position in key sectors. The relative openness of the UK to inward investment has attracted U.S. and European firms, with concomitant commercial and technological gains. As exemplified by the Centre for Manufacturing at Sheffield University, this has led to the creation of centres of excellence that benefit other industrial sectors. This underlines the value of aerospace as a vehicle for technological diffusion throughout UK manufacturing. While there are obvious geographic concentrations, aerospace, especially through its extensive supply chain has an impact in many UK regions, especially a number with low levels of research intensity.

3. In the Society's view, this record justifies continuing support for aerospace and for measures designed to maintain the underpinning technology and skills base. In particular, we would point to the challenges posed by sustainability. Growth in civil aerospace is now predicated on the development of environmentally friendly aircraft and engines. This will be necessary to reduce the carbon footprint of airliners, their high altitude emissions, as well as noise levels on take-off and landing. Achieving the stringent targets now accepted by industry and increasingly set by regulation will depend upon developing better understanding of the scientific and technical factors explaining aviation's impact on the environment. This in turn will drive research into novel materials, structures and mechanics that will enable aerospace to achieve sustainability by the 2020s. The UK is already in the forefront of this research; there is a clear case for reinforcing success and existing competence in green aerospace technology.

4. The development of better models of high altitude climate change and carbon reduction technology will also have wider benefits for UK manufacturing. The challenges set by aerospace are especially demanding and will help to drive the adoption of environmentally friendly products across the board.

5. Similarly, UK competence in space science and technology represents a further broad-based catalyst for British leadership in the exploitation of earth-resource satellite systems, advanced communication and data gathering and transmission that has had, and will continue to have an economic and socially transforming effect.

6. The requirement for future success will require a renewed dedication to supporting technology acquisition through reinforcing the partnership between government, industry and academia. The most demanding element will be to ensure an adequate supply of trained personnel in the relevant engineering disciplines, as well as in the applied environmental sciences. The UK has found it hard in the past to maintain an adequate base in these areas.

7. The recent decline in the demand for maths and science graduates in the financial services sector may afford some relief for companies seeking to recruit skilled personnel, but this may only be a temporary shift in individual career opportunities. It does not address the issue of supply of scientific and technologically trained young people through secondary and tertiary education. There are no new and easy solutions, but government and industry must continue to press for long-term improvements in the quality and attractiveness of engineering syllabi and the adoption of more holistic approaches to training.

8. There may be a need to address the balance of competing priorities in order to support aerospace and its associated science and technology base. But this need not be as drastic as it appears. Aerospace is a multi-disciplinary sector and its requirements help to push the state-of-the-art across many varied areas. Equally, with the right training and commitment to lifetime learning, people will not necessarily be locked into one industrial arena, but be available as a general skill base for the UK economy.

9. Aerospace is a future orientated industry. The UK has a world-class aerospace sector and is still protected to some extent by high barriers to entry. However, many countries, especially in the newly emerging economies of the Far East, have targeted aerospace as a growth sector and a focus for high levels of investment. These countries will challenge the UK's position in world aerospace. The UK has few such remaining world-class sectors and it would seem wise to maintain this capability and to afford it some priority in national policies towards science and engineering research and education.

April 2009

Memorandum 53

Supplementary submission from the Geological Society of London

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

"Has the time come for the UK—as part of a clear economic strategy—to make choices about the balance of investment in science and innovation to favour those areas in which the UK has clear competitive advantage?"

The Geological Society of London is pleased to have the opportunity to submit a follow-up response to this enquiry.

We respond in particular to question 2.

"Whether such a policy is desirable or necessary"

We believe that:

- Investment in science should be long term, at a planned sustained level rather than intermittent or subject to wide fluctuation.
- School science education, further and higher education and applied, policy-driven and fundamental/basic research are all essential elements of the national innovation system. All these areas require effective funding, and one cannot be funded at the expense of another, as a necessary (though not a sufficient) condition for innovation and wealth creation.
- It is not always possible, nor desirable, to consider "science" as composed of discrete individual research areas without overlap.

In light of the above points, it is not viable to seek to boost the economy by investing in specific areas of science only. Nor is it possible to look at UK science investment in isolation, but as part of a mixture of public and private investment across the entire Budget. If science is genuinely to be put at the heart of Government and Government policy, it should not be necessary to make a choice of one area of science over another, but to have a clear economic strategy, of which science is one key component.

If anything, we would argue that what is needed is not investment in favour of those areas in which the UK has clear competitive advantage, but the opposite—for different areas of science to view one another as potential collaborators rather than competitors. It is becoming evident that many of the most challenging problems facing the global community in this century cannot, because of complexity and magnitude, be solved by any one single research discipline but only by a suite of them extending, in many cases, across the realms of natural, social and economic-political sciences. There are already signs that, in some areas, the traditional late 19th and 20th century barriers between scientific disciplines are being breached as forcing by societal relevance makes collaboration between disciplines essential and increasingly illuminating.

To take one example, in 2010 the Geological Society is organising a two-day symposium that will bring together geologists and ecologists to see how past global warming events and ecology can inform present-day ecologists concerned about current and forthcoming climate change. There are many past examples of the benefits of such collaboration. British physicists at CERN came up with the World Wide Web, and British mathematicians at the National Physical Laboratory came up with package switching that enables the internet to work with large files such as video, and enables large mobile phone traffic. It is unlikely that such outcomes could have been predicted, and such advantageous collaborations would be lost by employing such a strategy.

An Investment policy on the part of responsible governments that facilitates continued growth of this trend in solving the 'big questions' now faced by the human community, will help bring science and engineering closer to the heart of government as well as yielding manifold benefits from local to global.

April 2009

Memorandum 54

Submission from Finnmeccanica

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

1. Introduction

We strongly support the proposed Direction Government intends to take in relating economic growth to a clear policy of investment in science, innovation and engineering which enhances the competitive position of the UK. Indeed it is an essential policy in this time of economic downturn as the major contributor to sustainable future growth. It is our view that the success of such a policy is dependant on the collective agreement (Government, Industry and Academia) on the criteria by which such balance of investment judgements are made. This should be developed from the outline principles tabled by Lord Drayson, namely:

- Where the UK has a clear competitive advantage.
- Where the growth opportunity over the next 20 years is significant.
- And where the UK has a realistic prospect of being No 1 or No 2 in the world.

Further, to deliver substantive economic impact we emphasize the engineering dimension in science, innovation and engineering as the effective means of exploitation. Creating a world class UK capability where the value in terms of revenue and employment is generated offshore through licensing is very much of second order impact. An "end to end" strategy is required whereby scientific research, applied technology and innovative engineering enable growth both in the national scientific and technical skill base and in the manufacturing capabilities needed for internationally competitive solutions.

In section 3 we offer our views as to the type of criteria which could inform such balance of investment judgements.

2. Finmeccanica's Position in the Debate

Today Finmeccanica is a £13 billion Turnover Corporation with major industrial footprints in the UK, US and Italy. We operate internationally in the Defence, Aerospace, Security, Transport and Energy sectors and some 12% of turnover is directed to Research & Development. In the UK we have around 5,000 scientists, technicians and engineers from across the scientific disciplines and we generate around £600 million of export revenues from our UK businesses. We have strong relationships with UK universities and technology providers working closely with regional development agencies to generate local centres of excellence. In particular our recent acquisition of DRS Technologies increases our US footprint to some 12,000 people providing both access to the large US budget and direct familiarity and participation in innovation models developed between US Government and Industry.

3. Balance of Investment Criteria

If the overriding consideration is to be globally competitive in readiness for an economic upturn then timing, differentiation and routes to exploitation are key. This suggests the following:

- An objective calibration of current positioning by market sector to establish existing economic contribution and evaluate the growth potential of further focused Research & Development.
- An assessment of UK Government spending priorities by department to determine where UK market drivers and therefore solutions have international resonance. Thereby recognising and potentially directing UK Government and Industrial spend in a manner which delivers domestic solutions capable of generating significant and sustainable export revenues.
- An evaluation of those technology clusters which will feature repeatedly in delivering world competitive solutions. Potentially establishing centres of excellence between Government, Industry and Academia around such clusters to create critical mass, avoid duplication and recognise the interdependence of core skills. Examples of such COEs would include:
  - i. Sensors and communications networks.
  - ii. Information and knowledge management.
  - iii. Autonomous systems and robotics.
  - iv. Advanced materials.
  - v. Life sciences.

Our recent experience in the Defence and Security sectors has confirmed to us the key role technology plays in differentiating solutions and the importance of a multidomestic industrial footprint (particularly access to the substantial US market) to maximise exploitation of UK generated intellectual property.

Further, and perhaps counter intuitively, successful industries in these sectors are having to adapt to counter rapidly developing and diversifying threats fostering a new approach to industrial/academic partnering improving agility and reducing response times.

4. Consultation

As stated we believe the proposed policy is both desirable and necessary. Despite the despondency surrounding economic downturn there are clear reasons to believe that such a policy could be successfully developed and implemented:

- The UK at the individual and institutional level has a track record of innovation.
- Top UK universities are recognised internationally as best in class. This pursuit of excellence needs to inform and restructure secondary and primary education in science.
- Some UK industries are globally competitive, have established international footprint and are capable of leveraging UK R&D into larger markets.
- Industry and academia have developed models for collaboration. The role of large science based industry in the UK in partnering with universities and SMEs will be key to growth given the lack of freely available capital and credit from third party investors.

In terms of consultation methodology whilst we believe that a wide solicitation of views from Government, learned societies, Industry, Academia etc. is a necessary starting point it is important to rapidly converge the debate around key market sectors. "End to end" stakeholders from R&D to exploitation need to group together to develop and cost strategic plans which will in turn enable UK balance of investment priorities to be effected. A useful by-product of this would to identify where and how different sources of Government R&D funding (universities, MoD, TSB etc.) might be better coordinated and directed to improve the gearing between investment and return at the national level.

It is perhaps premature to be definitive about those sectors which would benefit and those which will lose. However successful sectors will likely exhibit the following characteristic:

- Solving the UK's problems also addresses the needs of key export territories (for instance tackling the sustainability and environmental challenges being faced).
- The "solution" involves leading edge technology but also innovative and cost effective manufacturing and a route to international markets and international collaboration.
- The high cost of entry to competitors in terms of human and physical capital supports the sustainability of the sector in the UK.
- The sector can demonstrate that significant added value (revenue and employment) will result from achieving clear technological differentiation.

5. Summary

As a major employer of scientists, technologists and engineers in the UK with strong links to 30 of top UK universities we remain highly motivated to support the success of the proposed policy. Our graduates span the scientific disciplines from physics, maths, chemistry and engineering to bio and life sciences and we recognise their interdependence in delivering world class solutions. Within Finmeccanica we are developing a further initiative to foster innovation across our group and with our partners. This was briefed in outline to Lord Drayson during a recent visit and we would welcome the opportunity to expand on our actions in this area which we believe are entirely in sync with Government thinking.

April 2009

Memorandum 55

Submission from the Royal Astronomical Society (RAS)

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

1. The Royal Astronomical Society (RAS), founded in 1820, encourages and promotes the study of astronomy, solar-system science, geophysics and other closely related branches of science. The RAS organises scientific meetings, publishes international research and review journals, recognises outstanding achievements by the award of medals and prizes, maintains an extensive library, supports education through grants and outreach activities and represents UK astronomy nationally and internationally. The Society has more than 3,000 members (Fellows), including scientific researchers in universities, observatories and laboratories as well as historians of astronomy and others.

2. The RAS is pleased to offer the Committee supplementary evidence on this important topic. It follows the four points listed in the Committee's call of 24 March 2009.

3. Without having had time to consult its Fellowship widely, the RAS is unable to offer a firm view on the value of a discussion on the balance of investment in science. However, it is clear that to be of lasting value such a discussion should be open and inclusive, and should lead to general conclusions and recommendations.

4. The government decision making process which would follow such a debate should be open and transparent, and the reasoning behind the strategies adopted should be made public. The RAS endorses the five key principles set out in Lord Drayson's speech to the Royal Society and would suggest that what follows from those excellent principles is not that UK science funding should "favour those areas in which the UK has clear competitive advantage" but that it should favour those areas that are essential for the development of UK science and particularly those in which the UK needs to be competitive in the long term. The implications of adopting a strategy aligned to Lord Drayson's proposals could be profound for some sectors of UK science.

5. It can also be argued that a top down approach to science funding is at variance with the Haldane principle. Funding scientific research is not like investing to win Olympic medals, where specific short-term objectives can be set and achieved. Science advances on a broad front and has indefinite horizons. Short-term strategies tend to be backward looking and targeted funding does not guarantee success when the goal is to be "ranked no1 or no2 in the world". It is surely better to concentrate on funding excellence and on ensuring that the funding is sufficient to achieve the ambitious goals that should be set.

6. As stressed in many speeches, "it is vital that we maintain our investment in pure, fundamental science". This most certainly applies to astronomy and astrophysics, which is an area of enormous public interest (as clearly witnessed by the global success of the current International Year of Astronomy), attracts young people at all levels into science (and not just astronomy), draws on a wide range of scientific disciplines, has a superb record of technical innovation and, above all, is an area in which the UK continues to excel.

7. It is generally agreed that the UK ranks 2nd or 3rd in the world in terms of scientific output in astronomy and space science, measured by papers, citations, or citations relative to GDP. It is also generally agreed that the UK spends less on this research than comparable countries such as Germany, France, and Italy, although obtaining accurate and reliable data is complicated by different national structures and funding methods, and mundane issues such as exchange rates.

8. Astronomy is a global activity, facilitated by large multinational collaborations such as the European Space Agency or the European Southern Observatory, of which the UK is an important member. These collaborations give UK innovation and businesses access to world-wide markets at the cutting edge of technology. Examples include e2v Charge Coupled Devices (CCDs) and other imaging devices, which are used by all major collaborations and space agencies, Surrey Satellite Technology and EADS-Astrium, a major player in the world satellite business.

9. Data handling, storage, management and access are areas of growing importance in all fields, and astronomy is no exception. The international astronomical community is developing advanced tools through the Virtual Observatory (and the UK AstroGrid project) with the goal of making the world's huge astronomical data banks transparently useable, in just the same way that the World Wide Web makes documents all over the world feel part of a single interlinked system. This has implications which stretch far beyond astronomy or even scientific data.

10. In terms of Lord Drayson's "three criteria" it can be stated that in astronomy and space science

- The UK already has a competitive advantage, through the continued excellence of the people attracted into the field and judicious past investment;
- The growth opportunities both at home and within the collaborations such as ESA and ESO are considerable, and the potential benefits to UK technological development (including IT) are very significant;
- The UK is already in the top group of the "astronomy premier division" and can realistically expect to maintain this position given the necessary funding priorities.

11. In summary, therefore, the Royal Astronomical Society:

- Is in favour of an open, inclusive and independent debate on the balance of funding in science;
- Urges a transparent presentation of the government decisions which flow from such a debate;
- Stresses the importance of the Haldane principle, the focus on excellence, and the maintenance of investment in basic science, which underpins all science and without which the long term vitality of the science base would be undermined;

— Is concerned that a narrow focus on "economic impact" could result in funding being diverted to meet short term priorities, to the detriment of basic science and long term growth;

— Notes that the UK is already well placed in astronomy and space science to meet Lord Drayson's three criteria; and

— Recommends accordingly that astronomy and space science must be seen as priority areas for increased funding within the envelope of basic science funding.

April 2009

Memorandum 56

Submission from Dr Martin Dominik

In general, it makes a lot of sense to focus on the strengths rather than on the weaknesses. However, would it be of greater importance to discuss strengths of specific research sectors, or of the general approach to science funding? I would like to argue in favour of the latter, making the point that the implementation of procedures to achieve excellence should be our main priority, regardless of research area.

As a Royal Society University Research Fellow, currently working on the detection of planets orbiting stars other than the Sun, I am regularly given the frustrating experience that we are not making efficient use of one of our most valuable strengths: people and their creativity. In fact, I would judge this to be the crucial resource for making the difference in an international competitive arena over the coming decades. If we manage to set the right environment conditions to allow the existing creative potential to unfold, it would give us an unparalleled competitive advantage, by far outweighing any other possible measure taken.

Maximizing impact of science on our society, both on its culture and its economy, seems to be a promising strategy, while focussing on immediate economic returns will come short of efficiently advancing our society and aiming at largest benefits. The largest innovation potential is with fundamental research, whose outcome, by its nature, cannot be predicted. Curiosity has been proven to be a major driver of innovation, and we need to ensure that scientists who come up with groundbreaking ideas are given the opportunity to futher develop and realize these. Most strikingly, we lack of suitable procedures to identify future innovators, which would need to involve a proper assessment of the quality and innovation potential of their work. In my opinion, the Royal Society University Research Fellowship programme is a rare gem within the funding landscape, doing a good job on selecting researchers with a large potential to contribute to the benefit of our society and investing into people rather than projects. If, at the other extreme, for a research project to be funded, a proven concept and a long track-record are required (which in particular disfavours young talent), we can only be average, but will never achieve excellence. Big successes will only arise if we are willing to take some risk, the more predictable a research project is, the smaller its gain.

I am seriously concerned about procedures where priorities on research activities are set by scientists, which thereby become judges on their own case and sometimes even write part of the legislation. Self-appraisal schemes such as citation counts are unsuitable to measure the impact of scientific work on society, because the value to all of us is the determining factor rather than the relevance for a small group of specialists. I think that one needs to accept that science is an integral part of our society, and does not form a separate world with its own rules. Applied research fits into a market model with consumer demand for new or advanced products. When it comes to basic research however, one usually neglects the consumer". Given that the genuine role of a scientist is to increase the knowledge of the society rather than just his/her own, why should one refuse to listen to the wider public? If society would not accept the fact that fundamental research, following our curiosity, is beneficial, there would not be any public-sector funding at all. Are we not facing a democracy problem by thinking that members of the general public are not qualified to have a say on science issues? Where would this country be if we decided to adopt such policies in general? In fact, I found the unbiased judgement of laymen" frequently being better than that of experts, some of who just speak in favour of their personal interests rather than the common good.

I therefore arrive at the conclusion that a transparent public dialogue about the investment in science and innovation would be most likely to arrive at a result that is most beneficial to society. In contrast, discussions behind closed doors are more likely to serve the interests of those immediately involved at the cost of others (which might even include communities officially "represented").

April 2009

Memorandum 57

Submission from Professor Peter Dobson, Director of Begbroke Science Park, Oxford University

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

Executive Summary

This debate is timely and essential and should be inclusive and led by the Technology Strategy Board. There should be more emphasis on useful applied science and engineering that addresses national and international needs, and this in turn will create new businesses and benefit society. Government needs to help to translate the results of research to commercialization. There might be some loss to our pure science base, but the benefits of transferring effort to "useful" solution provision will be far-reaching.

Introduction

This submission is made by Professor Dobson, an academic engineer/scientist who has worked in both industry and universities. He has founded two companies: Oxonica plc and Oxford Biosensors Ltd and is responsible for setting up a unique type of Science Park as part of Oxford University. He is still an active researcher and his range of expertise is broad, covering nanotechnology, biomedical-sciences, energy and materials science and engineering. This memorandum addresses the four questions raised about putting science and engineering at the heart of Government policy.

1. *What form a debate or consultation about the question should take and who should lead it?*

The debate should be broad and definitely not confined to the research councils. It should especially include business and industry, professional institutes and probably be led by the Technology Strategy Board. The present set-up of the research councils is not effective and it needs to be overhauled.

2. *Whether such a policy is desirable or necessary?*

Such a policy is essential and is urgently needed. The UK has been sleepwalking into a crisis because there has not been any clear strategy about key issues of preserving our industry, our ability to provide sustainable energy, the safeguarding of future provision for water and food production and a clearly declining service of healthcare provision. This is not just affecting our country in these areas, it has greatly reduced our opportunities to create new businesses and export potential.

3. *What the potential implications of such a policy are for the UK science and engineering higher education, industry and the economy as a whole?*

A proper policy of capturing the inventive and innovative capabilities of our scientists and engineers to work towards strategic goals will have far-reaching consequences for the future of our country. It will restore a sense of purpose and bring together the pure science base to work more effectively with engineers and business. This should also have a profound effect on the way we conduct our education at all levels. We have to get across the messages that science has to have benefits and that the outcomes can be rewarding and useful. We need to instill an ethos of science and engineering as being "solution providers". One possible outcome is the realization that more Government intervention and support is needed for "translational research", that is, at the stages where innovation occurs, between the invention stage and the full-blown commercialization.

4. *Were such a policy pursued, which research sectors are most likely to benefit and which are most likely to lose?*

The sectors that will benefit are the manufacturing and creative industries which are so important to a modern economy. Amongst these should be sectors of energy, water, food production, healthcare and the consumer-based sectors of transport, telecommunications/IT and electronics. Some of the pure science sectors, especially physics may lose, but only if they stick to their insistence on doing blue-sky curiosity-driven research. There has been far too much spending and emphasis on pure science in the UK in the last 30 years, with the neglect of engineering and applied science. It is time to redress the balance.

April 2009

Memorandum 58

Supplementary submission from the British Academy

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY—CALL FOR SUPPLEMENTARY EVIDENCE: STRATEGIC SCIENCE FUNDING

A RESPONSE TO THE INQUIRY BY THE HOUSE OF COMMONS INNOVATION, UNIVERSITIES AND SKILLS COMMITTEE

Introduction

1. The British Academy, the UK's national academy for the humanities and social sciences, is pleased to respond to the Committee's call for supplementary evidence on the question of strategic science funding, and in particular we address Lord Drayson's question "whether the time has come for the UK—as part of a clear economic strategy—to make choices about the balance of investment in science and innovation to favour those areas in which the UK has clear competitive advantage"..

Summary

2. The British Academy makes the following key points:

All disciplines together

To deal with the challenges and to seize the opportunities posed by the economic downturn, it is essential that the UK is able to exploit the full range of expertise in its world-class research base. Scientific and technological advances can be used effectively only if political, social and cultural understanding is deployed in ways that ensure that all disciplines are able to work together.

National and thematic provision only where effective

Within the social as in the natural sciences, there is sometimes a need for large-scale infrastructural facilities, which have to be provided on a national basis. For example, those studying family formation and dissolution need access to good longitudinal databases. These facilities must be planned and maintained to support a wider range of research.

Managing research

While it can be useful for Government (in consultation with the research community) to identify certain broad overarching themes, it cannot micromanage research effectively.

Impact has to be judged in a broad sense and reasonable timeframe

Given the wide range of direct and indirect (social, cultural, economic and policy as well as technological and industrial) benefits flowing from the research base, it would be unwise to focus on the short term economic impact of research at the expense of other important and longer term impacts, including quality of life.

It is important to support basic as well as applied research

Applied research relies on the foundations that have been developed by basic research. Both basic and applied research have to be funded properly and on the basis of excellence, if the UK research base is to prosper. The worst of all possible worlds is to have poor research with high impact.

It is important to mobilise direct government research spend

Government departments (civil and defence) themselves control large research and development budgets. In 2005–06, their budgets, at £4,484 million, made up just under half of the Government's total spend on science and research, and almost matched the combined budgets of £4,800 million of the funding and research councils[189] The current debate on strategic science funding should be extended to include government commissioned research as well, so that tax-based support for research and development can be seen in its entirety.

[189] "Including the UK contribution of £365 million to the EU R&D budget, the grand total of all Government expenditure on SET in 2005–06 was £9,649 million. The Science and Engineering Base (Research Councils and Higher Education Institutions) accounted for 50% of total SET expenditure, with 20% by civil departments, 26% by defence, and 4% by the UK's contribution to EU R&D". Extract from SET Statistics: Net Government Expenditure on departments in cash terms.

MORE DETAILED RESPONSES TO THE COMMITTEE'S CALL FOR COMMENTS

3. *The interplay between subjects.* The UK will not be able to exploit its scientific advances without intelligent legislation, regulation, accounting and audit standards, and commitment to sustainable business models, which all rely heavily on the insights of the humanities and social science (HSS) research base. For example, consider HSS research on:

- effective and ineffective legislation and policy-making;
- effective and ineffective management and team working structures and practices in industry and safety critical services;
- ethical, social, legal conditions for effective research and innovation;
- revised accountability frameworks;
- more workable regulation of scientific work;
- behaviour change (which draws on expertise from economics, the sociology of consumer behaviour and psychology); and
- shaping public engagement with research and innovation.

4. *Fostering the UK's competitive advantage.* We agree that the UK must improve its exploitation of the full commercial value from research that has potential for economic impact, but it also needs to recognise that competitive advantage is rarely based on technological excellence alone. Factors such as effective regulation and financial architecture, design, branding and customer service (all rooted in various parts of research in the humanities and social sciences) are also essential in delivering and sustaining a competitive lead. The sources of competitive advantage, moreover, cannot be reduced to a formula or be readily predicted in advance.

5. If we are to grasp how deeply innovation matters for the UK's long-term economic well-being, it must be defined broadly, in line with last year's Government White Paper, *Innovation Nation. Innovation Nation* acknowledged that innovation is based not just on scientific and technological advances and took a holistic view of innovation. It highlighted ways in which the UK excelled at "hidden innovation", especially in its leading services sectors and creative industries (which draw heavily on HSS expertise). The UK cultural sector is considered by the OECD to be relatively more important (at just under 6% of GDP) than its equivalent sectors in the US, Canada, France and Australia. UNESCO estimates indicate that the UK is the world's biggest exporter of "cultural goods", surpassing even the US, and Lord Carter, the Government's Communications Minister, recently predicted that: "In five years' time, the creative industries [in the UK] could be as powerful as the financial services industry has been for the last 10 or 15 years".

6. HSS knowledge contributes to the creative industries in a number of ways, including:

- Content. Examples here include: the success of the UK computer games industry, driven as much by skills and knowledge from the arts and humanities as from computer science; the contribution of HSS research to academic publishing with a global market; and the way in which the UK's tourist industry—which employs just under 8% of the total work force and is the sixth largest industry in Britain—draws upon expertise in HSS.
- The intellectual property framework that is of fundamental importance not only to the creative industries but also facilitates (if the framework is designed appropriately) the effective exploitation of technological innovations.
- Planning, marketing and dissemination.

7. The UK will have to compete by developing new products and services, discovering new ways of doing business, and encouraging innovation in its public sector and public services. To succeed the UK will need to draw more effectively on the full range of research from the natural sciences, engineering, and the humanities and social sciences.

8. *Picking "winners".* Research seeks to challenge current thinking and practices and develop new approaches. Its outcomes cannot be predicted in advance, and it may be many years before the full impact of research can be properly realised. As an earlier Academy report said: "how can we decide what is useful knowledge and what is not. We fear that those who try to second guess what is 'useful', and what is less useful, knowledge may make the wrong decisions. Predicting which areas will prove to be the most important and most valued in the future is in its nature difficult, perhaps impossible". In the Academy's opinion, it is unwise to support a few subject areas at the expense of others, since this will narrow the options available to the UK, making it harder for the UK to respond to unexpected problems and developments in the future. As the outcomes of original research can never be anticipated in advance, any efforts to plan research will fail and risk distorting research priorities. We therefore welcome the Prime Minister's emphasis in his recent Romanes Lecture on the need for a broad base in science and research.

9. The Government is in a position to set (in consultation with the research community) very broad, overarching strategic themes for research. But it cannot and should not seek to micromanage the research endeavour.

10. If the Government wants to prioritise the science spend, it can already do so in terms of the funding that Government Departments control directly. The research and development budgets of Government Departments are considerable. The debate should therefore be broadened in scope to consider these budgets as well, so that the Government can consider research policy as a whole.

11. There must also be an appropriate balance between short and long term impacts, to enable the UK to respond both to current challenges as well as ones that it will face in the future. It would be unwise to focus on short term economic impacts of research at the expense of other important and longer term impacts. A policy on these lines will ultimately be ineffective and will run counter to the Government's objective that the UK should position itself so that it can fully exploit current and future opportunities.

12. *The importance of basic research.* A number of studies have shown that "blue skies" research can have far-reaching, and unexpected impacts, including unexpected business applications. Applied research has to build on the foundations that have been laid by basic research. Hence both have to be funded properly, if the UK research base is to prosper.

13. *The balance between strategic and responsive research funding.* It is essential that there should be an appropriate balance between strategic and responsive research funding. Some of the most innovative and creative research is funded through response mode.

14. *Attracting and retaining the best people.* The UK must also ensure that it can develop, support and retain the talent that is needed to take forward research innovations. The market for good researchers is global and highly competitive, so the UK needs to make sure that it can attract and retain the best people from the start of their research careers, as well as recruit some of the most talented mid-career researchers and groups. Once research expertise is lost, it is very hard to rebuild.

April 2009

Memorandum 59

Submission from the Natural Sciences Committee of the UK National Commission for UNESCO

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

This submission is provided on behalf of the Natural Sciences Committee of the UK National Commission for UNESCO, an independent civil society organisation set up by Government, in partnership with civil society, as the focal point in the UK for provision of expert policy advice, and for programme work, relating to UNESCO.

The National Commission is part of the global community of 195 UNESCO National Commissions. Unique to UNESCO in the UN system, National Commissions function as essential partners both of governments and of UNESCO, acting as catalysts to involve key national actors in UNESCO's fields of education, sciences, culture and communication & information.

"Has the time come for the UK—as part of a clear economic strategy—to make choices about the balance of investment in science and innovation to favour those areas in which the UK has a clear competitive advantage?"

We address each of the points raised by the Select Committee in turn.

1. *What form a debate or consultation about the question should take and who should lead it?*

Given the importance and pervasiveness of this issue, we are strongly of the view that the debate needs to involve high-level stakeholders from a wide range of sectors, including the research councils, industry, HEIs, NGOs and Government departments. Consideration should be given to using the Foresight process led by DIUS but with scrutiny provided by the Sustainable Development Commission. A facilitated workshop would help to identify key issues and explore some of the implications of pursuing particular lines. The list of Government's own Public Service Agreement targets could provide a useful framework.

2. *Whether such a policy is desirable or necessary*

Before attempting an answer, it is not obvious what "clear competitive advantage" means in this context. It could mean that we concentrate on what we already do well to the exclusion of new areas of research—an approach which will inevitably lead to stagnation. It may also make it more difficult to fund cross-disciplinary research and collaborations both within and outside the research community. There should be a balance between what we are good at and meeting future needs (both those already identified and those yet to emerge). The phrase might also imply a reduced priority for research directed at vital strategic areas but with no direct economic benefit.

Assuming that the phrase does not exclude such science, then we believe that achieving a sustainable future requires excellence and efficiency in the science base underpinning the development and implementation of environmental policy not only within the UK but in Europe and internationally. The intergovernmental/international science programmes of UNESCO—Intergovernmental Oceanographic Commission (IOC), Man and the Biosphere Programme (MAB), International Hydrological Programme (IHP) and International Geoscience Programme (IGCP)—provide an important coordinating framework for such activities, helping to ensure that public funds are used to address global problems in a more joined-up fashion.

Most global environmental problems require long-term investment in science and engineering and any refocusing of UK investment should aim to increase this rather than responding to relatively short-term economic fluctuations. We therefore need to preserve and further develop a national capability in key aspects of environmental science quite apart from immediate economic outlooks, recognising that with population growth, climate change, etc the demand for such knowledge is only likely to increase.

3. *What the potential implications of such a policy are for UK science and engineering, higher education, industry and the economy as a whole*

Our perspective is obviously international with a particular emphasis on working in programmes supporting development in other regions of the globe. Refocusing our scientific effort in terms of promoting UK economic competitiveness, as mentioned earlier, could jeopardise this. However, we note the Prime Minister's comments regarding poverty and inequality—that we should be "enlisting science in the service of humanity". We must have a policy that enables the free flow of information across continents and not necessarily one targeted for hi-tech economic futures of the UK; otherwise this would be just another form of intellectual imperialism. However, we should also provide leadership in science to the rest of the world in topics where we know we can make a difference. We believe environmental science is one such crucial area not only because of its intrinsic intellectual challenges but because of strong linkage to sustainability and peace. Reducing conflict, eg arising from mass migration in the face of climate change, is itself of great economic relevance and is likely to become more important as an issue with time.

It is welcome that the Government continues to hold the view that increased spending on science and engineering is required. The UK needs to have long-term environmental science to underpin policy and because of public good arguments we believe that should come from the public purse rather than vested interests. Knee-jerk funding reactions to sudden economic changes although understandable are to be avoided if at all possible. Experience has shown that when areas of research expertise are closed down they can take a very long time to re-establish and the increased competition from other countries is likely to make this even more difficult in the future. We also consider that the balance can be shifted towards long-term, strategic, policy-driven research without compromising on excellence; the Hadley Centre set up to support UK involvement in the UN Framework Convention on Climate Change is a good example. There is however a pressing need for better joining-up between research and policy and obtaining the appropriate mix between universities, research councils and government labs in achieving this. Returning to the international dimension, we note with approval the recent decision to appoint the FCO's first-ever Chief Scientific Adviser. That person will need to look outside the department for the best scientific evidence and it will be important that this engagement is with those parts of the scientific community that have experience of international programmes and organisations.

4. *Were such a policy pursued, which research sectors are most likely to benefit and which are most likely to lose*

Mention has already been made of the increased priority that should be given to environmental research. There are also spin-offs, eg the extraction of pharmaceuticals from the deep ocean—the largest gene pool on the planet. The energy sector is clearly of vital importance and Government has made clear its commitment to renewables and clean coal associated with carbon capture and storage. These continue to require much research which can also benefit from private sector finance; however, there is a strong need to ensure that knowledge sharing is not impaired.

On the loss side, there is potential for the biosciences to suffer. Although recent ministerial speeches on the subject of this consultation have cited examples such as bee colony collapse, GMOs, etc., thereby indicating awareness of the concerns being expressed, there is a fear that this area may be hit at the expense of the engineering and physical sciences.

April 2009

Memorandum 60

Supplementary submission from the Medical Research Council (MRC)

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT

Introduction

1. The Medical Research Council (MRC) contributed to the RCUK response to the original call for written evidence to this Inquiry; this was submitted in January 2009.

2. We welcome the opportunity to provide further evidence relating to Lord Drayson's recent proposals on strategic science funding as, for example, outlined during his speech to the Foundation for Science and Technology on 4 February 2009.[190]

3. The main question posed by the Minister is: "Has the time come for the UK—as part of a clear economic strategy—to make choices about the balance of investment in science and innovation to favour those areas in which the UK has clear competitive advantage?" Much will depend on how "area" is interpreted. Also we note that the question refers to competitive advantage, but it is not clear whether this means scientifically or economically competitive.

Response

4. The Committee has asked for responses to four specific questions:

(i) *What form a debate or consultation about the question should take and who should lead it?*

5. The debate should be led by Government, specifically DIUS, because it is the Science and Innovation Minister who has posed the question and is best placed to consult in a way that would provide the most appropriate evidence to answer it. In the first instance, the consultation should be aimed primarily at organisations (eg the Research Councils, Funding Councils, UUK, Academies), rather than individuals, as the latter is more likely to lead to a lot of special pleading that would be difficult to analyse and interpret. The consultation should lead to some specific proposals or options that might then be used as the basis for a wider public debate. The process should be as transparent as possible.

(ii) *Whether such a policy is desirable or necessary?*

6. The case for such a policy becomes stronger, the smaller the resources available for research. Despite the welcome increase in research funding in the last 12 years, the science and research budget is still insufficient to fund all internationally competitive research proposals. In times of relative plenty, researchers will carry out research to discover and translate new knowledge and much of this will be in areas in which the UK has clear competitive advantage.

7. Choices have to be made on the apportioning of funding. There are two main levels at which this happens currently. The first is in DIUS (in the case of the MRC advised by OSCHR) in deciding how the science and research budget is divided between the Research Councils (and others); the second is in the Research Councils in deciding which projects to support with the funds available. Regarding the first, there is no perfect way of deciding how to divide the science and research budget; the MRC is content with the present process which allows the Research Councils to submit proposals to DIUS and for these to be discussed. Regarding the second, the Secretary of State has indicated his support for the Haldane Principle[191] (April 2008), specifically that:

- Researchers are best placed to determine detailed priorities;
- The government's role is to set the over-arching strategy; and
- The research councils are "guardians of the independence of science".

8. If "competitive advantage" means scientifically competitive, then we believe that the Research Councils already do this in supporting excellence though peer review. There is good evidence through international comparisons that this is successful.[192]

9. If "competitive advantage" means economically competitive, then the MRC believe that it is important to maintain economic competitiveness. Research funding (public, charity and private) is one way to help achieve this goal. The MRC recognises the importance of, and engages with, the UK pharmaceutical, biotechnology and healthcare industries as significant contributors to the UK's economic and science base as well as the health of its population. However, any policy would need to recognise that the UK needs to grow new strengths as well as building on existing ones. The eggs should be distributed to several baskets, but we believe there is a case, at least in the short-term if funding is especially tight, that of necessity the number of baskets should be reduced.

[190] www.dius.gov.uk/news_and_speeches/speeches/lord_drayson/fst.aspx
[191] www.dius.gov.uk/news_and_speeches/speeches/john_denham/science_funding
[192] www.dius.gov.uk/publications/IntComparativePerformanceUKResearch.pdf

10. The policy could be implemented either though DIUS apportioning the science and research budget differently, or by the Research Councils focusing on particular areas. Both may be necessary. We favour an enhanced role for the Research Councils as they already do the latter through strategic and thematic approaches (including cross-Council programmes). This could be expanded in the way that the MRC has for example through MRC Technology (MRCT) and translational research initiatives, including the "Developmental Pathway Funding Scheme".[193] However, all Research Councils recognise the importance of protecting fundamental "blue skies" research that produces the discoveries on which longer-term future economic and social gain depends.

(iii) *What the potential implications of such a policy are for UK science and engineering, higher education, industry and the economy as a whole?*

11. The implications would depend on the extent of the change and the speed at which it was implemented. This question has been addressed in paragraph 9 above. The policy should be implemented in ways that would not damage areas such that they could not recover; nor that would create short-term hardship to institutions or individuals that did not allow them to adapt. Damage that can happen quickly may take decades to recover from.

(iv) *Were such a policy pursued, which research sectors are most likely to benefit and which are most likely to lose*

12. One sector likely to benefit is medical and health research, in particular the MRC and NIHR. The reasons are the quality of the research and its importance to the UK economy. The importance of medical research to the UK was recognised in the 'Cooksey Review' (2006)[194] which found that:

— "The UK Health Research system has many strengths. It has a long tradition of producing excellent basic science, with the MRC funding 27 Nobel Prize winners since its establishment in 1913. The quality of the health research base, combined with a national health service, creates a major selling point that attracts R&D investment from the pharmaceutical and biotechnology industries, which form a major part of the UK knowledge economy. And …

— The quality of the health research base, combined with a national health service, creates a unique selling point that attracts R&D investment from the pharmaceutical, devices and biotechnology industries. These industries form a major part of our knowledge economy. They are prime investors in R&D. The pharmaceutical industry alone accounts for 25% of UK business investment in R&D and it is a significant employer of highly-skilled staff. Given the sector's contribution to the UK economy, the healthcare industries are a key driver of wider productivity … .".

13. There is good evidence that medical research reaps economic and social benefits. A recent study,[195] for example, has estimated the value of health gains arising from research funded by public and charitable research organisations in two specific research areas (cardiovascular disease and mental health). The health gain, net of the incremental cost of delivering treatments through the NHS, between 1985 and 2005, specifically from interventions arising from cardiovascular disease research alone, totalled £53 billion.

15. The MRC has a strong track record in commercialising the output from its research (through MRCT). Licensing income receipts from all sources reached £85.4 million during 2008–09. This brings the total cash generated from MRC intellectual property since 1998 to £384 million.

16. Since the establishment of OSCHR and the confirmation of the Science Budget allocations for 2008–09 to 2010–11, the MRC and NIHR have invested heavily in translational research and training, in particular to accelerate the translation of basic research into health gain and products. Details are in the OSCHR Chairman's First Progress Report,[196] and also on the MRC website.[197] We believe it important that this level of investment is increased to benefit the UK scientifically and economically.

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[193] www.mrc.ac.uk/Ourresearch/Boardpanelsgroups/TRG/TranslationResearch/MRC005473
[194] www.hm-treasury.gov.uk/d/pbr06_cooksey_final_report_636.pdf
[195] www.mrc.ac.uk/Newspublications/News/MRC005237
[196] www.nihr.ac.uk/files/pdfs/OSCHR_Progress_Report_18.11.08.pdf
[197] www.mrc.ac.uk/Ourresearch/Boardpanelsgroups/TRG/TranslationResearch/MRC005473

Memorandum 61

Submission from the Association of Research and Technology Organisations (AIRTO)

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

"Has the time come for the UK—as part of a clear economic strategy—to make choices about the balance of investment in science and innovation to favour those areas in which the UK has clear competitive advantage?"

Two aspects of competitive advantage are relevant to this debate. The first relates to the UK's ability to sustain its position in the global economy, through trading and economic activity. The second relates to competitiveness of the research base in generating new knowledge, whatever the purpose. These two aspects of competitiveness are linked and the linkage should perhaps be debated more fully. There has been an assumption that highly competitive research will feed through to economic and social benefit, but the mechanisms and processes that capture the benefits are poorly understood in some quarters and poorly supported. The timescales are also unclear and uncertain in many cases, particularly in the case of the more fundamental areas of scientific research.

A policy that brings greater purpose, direction and support to stimulating relevant, high quality research outcomes and leveraging them into business activity that is well positioned in global markets would potentially be of great benefit to the UK. Therefore we offer the following perspectives:

- Our strong belief is that a policy of the kind proposed is essential to underpin the sustainability of a strong research base in the UK and the beneficial impact that it can make on the UK economy and quality of life.
- AIRTO's members and their business clients are very familiar with the opportunity assessment and prioritisation processes that are required to operate within such a policy. They are also familiar with the wide variety of opinions and the requirements for change management that the introduction of such a policy will bring.
- In order to promulgate better understanding, and ultimately acceptance, of such a policy, a key area for discussion will be the nature of what is required to capture and deliver economic and social benefit from publically funded research (and why this is necessary in the first place). This is particularly important where the research is not necessarily aimed directly at economic or social objectives but instead at the generation of new knowledge and at the education and training of a highly skilled workforce. A key issue has to do with the relationship between the public sector and private business and which constraints should or should not attach to the exploitation of publically funded research work.
- The likely result of adopting the proposed policy will be an increase in the research undertaken to tackle some of the major challenges facing society and our economy (challenge led research, grand challenges etc). It should also result in increased resources for near-market work, research and education in engineering and design, activities which lead to risk reduction, operation of knowledge transfer programmes and the support for the proof of concept programmes needed to embed new technology into successful businesses.

It is widely recognised and accepted that the UK has an excellent, high quality and highly productive research base. This attracts collaborators and investors to our research institutions, produces high quality research staff and trained graduates, generates new intellectual property and raises the profile and prestige of the UK on the world stage. The challenge is to ensure that the UK captures the greatest possible economic benefit from this work, thereby assisting in the generation of the wealth needed to sustain our economy, quality of life and public investment in research.

Whilst some of the largest high technology businesses can capitalise on the research outputs unaided, the complexity of the processes, the time-scales involved and the risks inherent in commercial uptake mean that public funding to assist with proof of concept and de-risking of technology is needed to enable the majority of the UK's businesses to take on the results of new research. The UK spends too little on these near-market activities and demonstrates a greater level of risk aversion than many of its global competitors. Leaving it to business and the market alone will not work.

The continued recognition that there is a problem in the exploitation of our research and development and the desire to do something about it has led to a plethora of new initiatives and new bodies to deliver them. We believe that, wherever possible, increased support should be delivered through existing initiatives and organisations, using both public sector bodies and institutions and private sector resources that have the required skill sets and delivery capacity.

Alignment of excellence in research with areas of competitiveness in the economic sense will require management and appropriate incentivisation of the academic community to shift focus and leave behind some of the more mature, familiar and traditional areas of work. To bring this about, there may have to be some lessening of funding in traditional areas of responsive mode research in favour of newly targeted areas of research.

This debate also introduces the notion of 'who is the customer' for the research, be it the tax payer, the government, its funding bodies or, arguably, the business community in general.

Perhaps Lord Drayson should chair the debate, involving DIUS, BERR, the CBI and the constituencies they represent as a minimum. A combination of tasks undertaken by the aforementioned stakeholders, coupled with open meetings to discuss options and findings, would be appropriate. AIRTO would be pleased to engage, both to contribute the combined experience of its members to the discussion forum and to help channel information from its wide range of business and industrial communities.

Such a consultation needs to be carefully led to achieve a good balance of buy-in through discussion and efficient delivery by a tight, task-driven group of expert team members. Good communication through discussion is time consuming and costly but worthwhile if it achieves inclusivity, motivation and buy-in from all concerned.

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Memorandum 62

Submission from the John Innes Centre, the Institute of Food Research and the Sainsbury Laboratory

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY—CALL FOR SUPPLEMENTARY EVIDENCE ON STRATEGIC SCIENCE FUNDING

COMMENTS FROM THE NORWICH RESEARCH PARK-BASED, BBSRC INSTITUTES, THE JOHN INNES CENTRE AND THE INSTITUTE OF FOOD RESEARCH, TOGETHER WITH THE SAINSBURY LABORATORY

Strategic science funding—what form should a debate or consultation about the question take and who should lead it?

The Institutes believe that there should be a broad debate and a formal consultation. We suggest this could be led by a number of organisations jointly, including your Committee and the Royal Society in addition to Government representatives from DIUS and BERR and industry-organisations such as the CBI.

Major steps should be taken to involve harder-to-reach audiences outside the mainstream academic and parliamentary community but whose views will be valuable in establishing such a fundamental policy. The views of 'young science' should be actively encouraged. It would be an interesting initiative to introduce modern e-communication mechanisms such as webcasting to add an additional dimension and attract more input from scientists at the bench who would not otherwise concern themselves with such discussions, but whose commitment is key to the UK's future competitiveness.

Is such a policy is desirable or necessary?

We believe that science and engineering should be at heart of Government policy. The question is whether Government should put policy at the heart of science and engineering ie what is the Government driver—economic impact or excellence?

Although it is recognised that economic and social impacts are of increasing importance, these benefits rarely appear rapidly, and often the rewards are serendipitous rather than strategically planned. Furthermore, work that appears to have no economic impact today, may turn out to be of crucial significance during changed circumstances in the future. Since nobody (perhaps especially not industry, which is usually preoccupied with addressing short term problems) has a monopoly of wisdom on which S&T will be most useful in the future, it would be unwise to be too prescriptive on the basis of current consensus about needs. In the current financial climate there may be a political driver to show value for money from research, but driving research too strongly towards impact and direct delivery risks undermining the quality of the science base that currently feeds technological development. Additionally, the benefits of science in one sector may be realised in quite another sector.

What is important is to fund the best fundamental research and the best applied research with suitable bridging mechanisms to facilitate translation of fundamental science into application.

Currently, Research Council funding is provided for fundamental research but there are fewer mechanisms for translation. The translation mechanisms in place often require early stage funding/support from industry. Not all UK industries are able to support at early stages due to market pressure and low margins—for example compare the pharmaceutical industry with the food industry.

What are the potential implications of such a policy for UK science and engineering, higher education, industry and the economy as a whole?

If this policy is implemented, some international quality, basic science might not be funded. Scientists will feel under pressure to deliver economic impact over an unrealistically short timescales, as will funding providers. Some industries will not have a national scientific base to build on and will look overseas which could lead to lost intellectual property or funding moving abroad.

The definitions of areas of excellence are rather broad and lack detail, and will certainly be controversial. Concentration on scientific excellence ignores national strategic importance, for example the need to support UK industries on issues such as food security.

Research is a continuum leading from basic, to strategic, to applied science and application. The Institutes believe that it is simplistic to concentrate on one part of the continuum whilst neglecting another. Not only will over-concentration on application and short-term impact risk cutting off the supply of new ideas coming along the science-conveyor, but undue concentration on fundamental science may also lead to ideas that do not get translated into processes or products (or taken up outside the UK).

Were such a policy pursued, which research sectors are most likely to benefit and which are most likely to lose?

Due to its financial/political weight, the pharma sector might win out at expense of other key areas. Areas with little or no direct, short-term economic impact could struggle eg longer term studies in human health where investment costs are high and 'payback time' is often long.

The danger is that the areas which lose out will be determined by industry or politicians rather than based on objective, scientific criteria. The UK's contribution to publication rates in top journals will fall (either due to poorer basic science or restriction on publication for commercial reasons), and the overall international standing of UK science will diminish.

April 2009

Memorandum 63

Supplementary submission from the Institute of Physics (IoP)

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY—SUPPLEMENTARY EVIDENCE

What form a debate or consultation about the question should take and who should lead it?

It is not clear from Lord Drayson's speech what is meant by favouring those areas that have a clear competitive advantage. Should we infer that advantage is used here in an industrial, financial, or intellectual sense? One interpretation of the question is that a drive towards exploiting the UK's competitive advantage will be reflected in further movement towards directed/thematic programmes (for which there has been a steadily increasing bias in recent years) at the expense of responsive mode support for curiosity-driven research. On that note, RCUK has just announced three new areas for directed programmes.

If there is going to be an open debate then a wide-ranging consultation exercise should be led independently by RCUK, involving requests for written submissions and meetings/workshops with all stakeholders to discuss the question in depth.

Critically, the premise of such a consultation will depend on which quantitative measures are used to define research endeavour that has "a clear competitive advantage". Will it be: the international reviews of physics, chemistry, etc.; PSA target metrics for the UK research base; the RAE2008 results (but UoAs are not comparable); or the number of spin-offs and licenses?

Whether such a policy is desirable or necessary?

The research councils are already adopting policies which imply that the emphasis is shifting to one of funding research that shows potential, in advance of a research project being undertaken, of economic and societal impact. This is evinced by the request for two-page impact plans for grant applications and, in EPSRC's case, a shrinkage of 15% in its responsive mode funding budget to support its mission-based programmes.[198]

[198] http://www.timeshighereducation.co.uk/story.asp?storyCode=401172&sectioncode=26

It is important to understand that many of the areas in which the UK has a 'clear competitive advantage' are firmly based in the area of independent curiosity-driven research, where the creative talents of a large community can be harnessed. Such areas frequently involve the activities of several competing research groups, where a mixture of competition and collaboration leads to rapid progress and puts the UK in a leading position.

Such curiosity-driven research has created completely new technologies and industries. Evidence for this is the recent report by the Russell Group[199] which showed that curiosity-driven research can have a far greater social and economic impact than research carried out with a specific commercial application in mind. It showed that the commercialisation of curiosity-driven research generated average returns of £44 million for Russell Group universities; more than twice the average returns from applied research. The report concluded that the government's push to direct more funding at applied research, where economic impact is predicted in advance, would have resulted in a loss of £1.2 billion to the UK economy.

Both the recent RCUK Review of UK Physics and the RAE2008 results showed that UK physics is in a good state of health and that physics departments perform curiosity-driven research of the highest international quality. Much of this curiosity-driven research is funded through the responsive mode mechanism, where the focus is exclusively on the quality of the research proposed. The RAE2008 physics sub-panel's report, quite emphatically stated that:

> "Many of the world-leading research outputs observed in submissions originated from small responsive mode grants. The sub-panel believes that continuing availability of such grants is absolutely vital to encouraging and sustaining groundbreaking research activity. Both national and European funding agencies are concentrating heavily on large collaborative programmes which, though worthwhile in themselves, if pursued to the exclusion of smaller scale grants, may place the nation in a weak position in the future. . ..The physics and science community cannot know where future developments will come from, and attempts to focus funding too narrowly into priority research areas (or priority departments) will limit rather than enhance the prospects of breakthroughs at the highest level".

It is also important to realise that such research has been the main driver in enhancing the international impact of the UK academic sector so making it more attractive to foreign students who bring in substantial income and often end up contributing to increasing the skill level of the UK workforce.

One of the main problems the UK has to overcome is that is simply not being innovative enough in commercialising this scientific endeavour. More attention has to be given to the translation of research into product, which is perhaps where the debate should actually lie.

What the potential implications of such a policy are for UK science and engineering, higher education, industry and the economy as a whole?

The potential risk is that some stakeholders may have to shift their focus from customary areas of expertise into less familiar territory, such as directed programmes. The International Review of UK Physics and Astronomy Research 2005 reported that such programmes can play an important role as a response to new developments and/or as a means to enable collaboration between two disciplines. However, one drawback is that there is insufficient transparency in the selection of themes. Hence, such programmes should be used with restraint and not at the expense of responsive mode funding.

Were such a policy pursued, which research sectors are most likely to benefit and which are most likely to lose?

Within science and engineering, it is likely to be the engineering disciplines and the more applied sciences that will benefit while the purer aspects will be reduced in emphasis. For example, those areas of physics, which are long-term in their planning and nature, and involve collaboration with many other countries (eg the Large Hadron Collider at CERN), will not be viewed as being able to deliver short-term economic impact.

Such a policy would lead to a reduction in research grants that will have a major impact on the ability of physics departments to attract and retain internationally leading research staff. Furthermore, critical mass in these areas, once lost, would be extremely difficult to recapture, as is clear from the shortage of trained people in nuclear physics and engineering which threatens the UK's plans for new nuclear build and decommissioning.

In conclusion, it is essential for the UK to support a broad research base and not attempt to pick winners. It is not clear whether focussing on select, narrow areas will result in short-term economic gains, but it is obvious that in the medium- to long-term, it will undermine the UK's ability to retain the highly trained, inventive and innovative scientists and engineers who will maintain and strengthen the UK's international competitiveness. It is these people, particularly those that have been attracted to the UK by a funding system

[199] The Economic and Social Benefits of Research; http://www.russellgroup.ac.uk/home.html.

and academic ethos that allows them to pursue curiosity-driven research, who will enable the UK to respond to new discoveries for which the economic and societal impacts are manifold, but which are much more diffuse and harder to quantify than for example, profits in a manufacturing company.

April 2009

Memorandum 64

Supplementary submission from Semta

IUSS COMMITTEE INQUIRY "PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY"

Summary

Just as important as choosing which areas of science and innovation should attract funding is the balance of investment between research and bringing innovation to the market.

To narrow the scope of investment in science and research brings all the potential increased risks and benefits of any such investment decision—through increased focus, the organisation/nation is exposed to more risk but greater potential payback.

The Debate on Investment Choice

Semta is of the view that, while Lord Drayson's comment is most definitely worthy of debate and public consultation, perhaps the greater debate should be around how investment is used to bring science and innovation to commercial/social advantage. Before lines are drawn around specific "subject" areas for investment, there would be much value in looking at the balance of investment in research compared to investment in bringing products and services to the market.

We believe that there is significant scope to increase the UK's exploitation of its science and innovation. Semta's work with science and engineering companies on initiatives such as the Sector Skills Agreements has highlighted the potential which companies believe is still to be harnessed from improving New Product and Process Development and Implementation (NPPDI). This was a key area identified throughout Semta's companies, from automotive to bioscience companies.

The Desirability/Necessity of Such a Policy

Science, innovation and research are international markets, and there is certainly value in the argument that countries attract world class talent to particular disciplines if they are known as the world leader in such subjects.

However, as a result of this international market, new discoveries and breakthroughs are often clearly identified as international undertakings, with the diverse nationalities of the individuals involved recognised. This reflects some of the cachet back to their original nation. Therefore, some of the benefits which might accrue to a country for being the "host" of such innovation are dispersed to all the nationalities involved.

The Potential Implications

By definition, innovation is new and often untried—and therefore competitive advantage has not yet been established. If investment only flows to areas where the UK has "clear competitive advantage", establishing that advantage will be difficult where technology, products and processes are new and "innovative by this description.

Narrowing the scope of investment for any venture does present risks. If the UK were to focus on particular areas, effectively reducing the diversity of its science and innovation "portfolio, it is then exposed to a higher risk of a single external factor having a large impact. For example, investing in development of a particular technology, which is then quickly superseded by another country's innovation.

Also, science and innovation does not fall into neat "boxes" in terms of sub-sectors or disciplines. It may be difficult to find discrete "areas" as suggested by Lord Drayson, with specific scopes and limits, beyond which investment will not go.

April 2009

Memorandum 65

Submission from the University of Oxford

The University welcomes the opportunity to respond to the Committee's call for evidence. Oxford is one of the country's most prominent centres for world-leading research in science and technology and has one of the best records for spinning out businesses. It is therefore well placed to comment in response to Lord Drayson's recent proposals on strategic science funding.

Summary

— Debate should be globally informed, in particular by models of how investment in science and technology deliver impact elsewhere in the world and, importantly, should take a long-term view.

— A strong fundamental science base and an applied science infrastructure are both key to the generation, recognition and exploitation of the ideas that will ensure UK successes in the long-term.

— A business culture is required that is not overly risk averse, in which risks can be taken and ideas taken forward with reasonably low barriers.

— A focus on particular areas based on competitive advantage and perceived economic return is unlikely to lead to sustained economic impact over the long term. Some of the UK's areas of competitive advantage do not promise immediate economic return. Those that do so are unlikely to be sustainable in the long-term without underpinning core science and technology.

Form of Debate and Who Should Lead

1. The debate should be informed by a global perspective and a long-term view. In particular the debate should be informed by the experience and practices of countries that are successful in this arena, including the USA, Japan and Germany.

2. The debate should be led by professional societies—Royal Society, Royal Society of Chemistry Royal Academy of Engineering, Institute of Physics etc. These bodies can provide a long-term view from an international perspective on research, development and impact. They have the trust and respect of the research community, are more independent from government policy than the Research Councils and would not have the same vested interests in terms of future budgets and operations that individual Research Councils might.

Whether such a policy is desirable or necessary?

3. This can be questioned. The fundamental character of research is evolutionary. That is, ideas are generated, explored and categorised. Some turn out to be fruitful but many don't. This means that a sufficiently broad research base is needed both to generate the ideas and to recognise and exploit them. In most cases these two functions are not coterminal and do not arise from the same persons or groups. Therefore there is an inherent danger in 'focusing' that risks the functioning of the enterprise as a whole.

4. However, it is certain that we could obtain better returns on basic research by better exploitation of knowledge generated. This is done much better elsewhere, in particular in Germany. There the model is to have both a strong fundamental science base (eg Max Planck Gesellschaft and Universities, funded by DFG) and a strong, and large applied science infrastructure (eg Fraunhofer and Leibniz Gesellschaften and Universities, funded by BMBF). This feeds a high-tech industry that has a high-value export capability. A different model underpins US success, but similarly there is an infrastructure that can develop new ideas easily and quickly and move them to market. In both cases it is the multiplicity of opportunities that is key, not a fixed path. Focussing research goes in the opposite direction; this again can be questioned and is an untested model.

Potential Implications

5. The pool of ideas that underpin innovation has to draw widely on all disciplines. It is often the cross-fertilisation of ideas from one area into another that leads to new insights and progress. Therefore restricting the UK to a few areas of 'excellence' may ultimately be self-defeating.

6. Further, it is very difficult to pick winners and losers at the early stages of idea development, so there is a real danger of picking the wrong one(s). It is necessary to have a broad base and many avenues for exploitation—this leads to a stable and viable network. Additionally this means that the culture of research should not be risk adverse. Ideas need to be taken forward.

Likely Winners and Losers

7. Obvious likely "winners" include research areas such as biosciences. However it is not clear that further investment in any area of strength will generate the best proportional scientific or economic benefit. Ultimately the UK is limited by its size. We do not have the ability to grow cutting edge biosciences indefinitely because innovation is about people and their creativity.

8. The UK can demonstrate a strong competitive advantage in areas such as astrophysics, particle physics and mathematics. These areas attract some of the brightest young minds. However such fundamental subjects have economic impacts that are not as immediate or as quantifiable as those in other areas and therefore these subjects risk being losers in terms of focus. This should not be allowed to happen.

9. Engineering and applied sciences are not UK strengths, and therefore may not receive investment. Yet it is hard to imagine that other areas on which the UK might focus, such as health sciences will remain leading edge in the long term without these underpinning core technology areas. The major themes for RCUK cross-council research are so broad that they demand excellence in all areas.

Concluding Remarks

10. Our comments support the conclusion that a focus on particular areas based on competitive advantage and perceived economic return is not likely to lead to sustained economic impact over the long term. The UK must be flexible in order to maintain leading-edge, impactful science and engineering that can remain internationally competitive in a sustainable way.

11. Approaches should include: the focus of new funding in areas in which we are currently weak but that are ripe for discovery and where the outcomes are likely to bring economic benefits that link to some of our industries (eg nanoscience); establishing and supporting strategic centres of excellence in both basic and applied science and engineering (Max Planck/Fraunhofer type institutes) around the hiring of top scientists and engineers from abroad; engagement from UK businesses; and support of our strengths in fundamental research and training.

April 2009

Memorandum 66

Supplementary submission from the Royal Society of Edinburgh (RSE)

PICKING WINNERS OR RESPONDING TO DEMAND: SUPPLEMENTARY EVIDENCE FOR SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

1. The Royal Society of Edinburgh (RSE), as Scotland's National Academy, has been heavily involved in the development of science strategy in the UK and Scotland, and therefore welcomes the supplementary call for evidence from the Innovation, Universities, Science & Skills (IUSS) Committee relating to Lord Drayson's recent proposals on strategic science funding.

2. "Has the time come for the UK—as part of a clear economic strategy—to make choices about the balance of investment in science and innovation to favour those areas in which the UK has clear competitive advantage?" was the question posed by Lord Drayson in a speech on 4 February 2009. Its thrust has subsequently been supported in speeches by the Secretaries of State for Innovation, Universities and Science and of Business Enterprise and Regulatory Reform and the Prime Minister.

A. *Is such a policy desirable or necessary*

3. Fundamental scientific understanding, derived from basic research has been over the last hundred years the ultimate driver of much of the dramatic, but unpredictable technological progress that has changed, and will continue to change the way we live. However, notwithstanding two decades of highly competitive processes in the UK that have fostered an ethos of competitive excellence that has made our science base the best structured, most productive and cost-effective in Europe and, globally, second only to that of the USA in its scope and impact, the dilemma remains, that the science base is less effectively exploited for social and economic benefit than we would wish.

4. Given this dilemma, Lord Drayson's question is highly appropriate, but it is vital to avoid too easy an answer that risks undermining rather than enhancing the science base's potential to deliver benefit. If the question's implication is that we should concentrate more resource in particular areas of science, we are

highly sceptical that a simple shift of, say 20% of funding from earth science to life science, or mathematics to communications, or a massive part of humanities and social science funding to STEM research would have the desired effect. Such an approach ignores the underlying structural problem.

5. Over the last decade, the push from the science base has been greatly increased as universities and institutes have adopted a contribution to innovation as part of their mission, increasing the rate at which spin-out and start-up companies have been formed and being highly creative in forming links with business.[200] Important though these processes are, they are highly unlikely to contribute significantly to growth of the magnitude required unless this science base "push" is reciprocated by business "pull". It is our view that the sub-optimal translation from the science base into utility is a deep-seated structural problem that results from a deficiency of "pull" from industry on the science base. It is reflected in relatively low levels of R&D investment, a problem that is magnified in Scotland, where industry is dominated by low research intensity sectors.

6. We believe that Government has tools in its hands that could stimulate business demand "pull", and that this should be the focus of Government policy rather than yet another supply-side initiative to pick winners. We go on to suggest what this stimulation should be in section B.

7. First however, it is important to be clear about the function of that part of the science base concerned with fundamental research. One of the most important properties of the science base is to act as an insurance against an unknown future, a source of ideas of potential and of skill able to respond to unpredictable challenges and opportunities. New opportunities may be offered by the science itself, or by new market demands or opportunities. Not only should the science base be able to address current demands and opportunities, but be sufficiently diverse in areas not currently in vogue to respond to the unexpected.

8. It is crucial therefore that the UK maintains a strong, balanced portfolio of science, especially given that new developments often emerge from interdisciplinary and multidisciplinary approaches, whilst assessments of technological potential have invariably missed the mark, with a lamentable record of anticipating future developments only a few years away.[201]

9. Furthermore, picking "winners" also picks "losers", creating weaknesses that could undermine our capacity and capability to respond to opportunity. The UK has a strong, broad research base compared to the rest of Europe, and which makes a significant contribution to the world scientific endeavour. It does not need to prioritise, unlike for example Singapore, which is so much smaller.

B. *What the potential implications of such a policy are for UK science and engineering, higher education, industry and the economy as a whole?*

10. Notwithstanding these provisos, understanding how best to ensure "translation" of fundamental research into utility is a crucial challenge. We believe that the question of adjusting the balance of investment in science and innovation to favour areas in which the UK has clear competitive advantage should be answered in a different way to that implied by Lord Drayson's question, and which addresses the structural deficit described above.

11. Examples from elsewhere (eg the USA, Taiwan) suggest that sustained commitment to technology areas where there are large actual or emerging markets creates a more effective mechanism for making choices. Such commitment should not have the short term horizons of many initiatives that hope for quick wins, but should have a timeframe of decades at least. The Council for Science and Technology recently suggested[202] a process through which such technology areas should be identified. They should be areas where the UK has world-leading capacity; which have large actual or potential growing global markets (in excess of £100 billion); where UK has the businesses, structures and people able to take developments to market; where there are strong, positive societal benefits; where technology risks are low and where Government is able to intervene, not merely or necessarily through funding, but also through regulation. For example, the Government's recent proposals in favour of low carbon vehicles could, if developed through regulation and the provision of infrastructure, promote major growth in this sector. Mission driven research which focuses on particular areas leads to a "derived" demand for certain kinds of fundamental research linked through knowledge exchange and translation possibilities into mission related applications.

[200] On this note, we are very concerned that the collapse of investment finance over the last 9 months threatens the survival of the many early stage technology companies that have been created from the science base in recent years, and in which Britain has led Europe. These should in principle be the seed corn for future industrial growth. They could be destroyed within the year. Moreover, the University/VC deals designed to build on these successes have also collapsed. A source of risk capital to support these enterprises over the period of the recession is vital. The banks are not fulfilling this role. Government should.

[201] For example, US President Roosevelt, in 1937, set up a Commission to advise on the most likely innovations of the succeeding 30 years. They not only identified many unrealised technologies, but missed nuclear energy, lasers, computers, xerox, jet engines, radar, sonar, antibiotics, pharmaceuticals, the genetic code and many more.

[202] *Strategic decision making for technology policy.* Council for Science and Technology, November 2007.

12. Such initiatives send strong signals to relevant industry that encourages long term and external investment. Business R&D in such areas also stimulates a response from the science and technology base, and from Research Councils and others who support research. Moreover, the history of science is full of examples of fundamental research being driven by the need to explain phenomena that emerged in applications. We believe that such an approach is a natural, more powerful means of exploiting the strength of the science base rather than top-down prior selection of research areas in the hope that the choice will prove to be correct. For such an approach it is important to maintain the diversity of the science base, as the demands of market driven technological development on the science base may prove to be more diverse and unexpected than could be predicted by early choice of research winners. In this scenario, the diversity of the science base is a strength and not a weakness.

13. Whilst the "Haldane Principle", that the science community, rather than government or administrators should decide on prioritisation of research directions, has created one of the world's most efficient and powerful science bases, another aspect of Haldane's recommendations has been neglected, that of the importance of mission driven research. We strongly advocate such a dual approach. It is the solution that emerged post-war in the United States and that has been so successful. It has created a diverse and adaptable basic research enterprise, coupled with sustained, long term investment in "platform" technologies that ultimately provide perennial spin-off that can be exploited by companies that pull strongly on the research base for technological solutions, and has been further stimulated in recent decades by the power of public procurement through the SBIR scheme. For example, a mission-driven component of national strategy might have been more effective, ten years ago, in ensuring that the UK exploited its early lead in stem-cell technologies in the period when stem-cell research in the USA was restricted. We need to see initiatives actively designed to create new global winners in the UK economy. This should involve initiatives from the NHS, MOD, Local and National Government, HMRC etc. It should also involve bodies from the wider public sector such as OfCom. All public agencies should expect congratulation if they help one or more British companies to build commercial success.

14. Although there have been attempts to use public procurement in the UK as a stimulus for R&D based innovation, it has not as yet developed into a powerful mechanism. We strongly advocate a more decisive and coherent effort from government in this domain. The unique form of our National Health Service, for example, could be a powerful driver of technological and business development, and should be promoted as such with greater urgency.

15. The development of such a twin-track approach will require appropriate institutional responsibilities. The Cabinet Sub-Committee on Science and Innovation should play a key role in developing a national strategy, providing leadership in terms of objectives, processes and bodies, that is agreed and supported at Cabinet level, and should ensure cross-government implementation and integration of relevant activity. The Technology Strategy Board should have the role of identifying key long-term opportunities and stimulating the intermediary bodies (such as the Research Councils, University Funding Councils and Regional Development Agencies) with the aim of commercialising valuable technology-based intellectual assets.

C. *Were such a policy pursued, which research sectors are most likely to benefit and which are most likely to lose?*

16. We have argued above that prior shifting of the balance of research funding by picking winners is not a wise strategy. We should rather develop a mission-driven approach with sustained Government support, resulting in selection in response to demand. It avoids serious errors from mistaken choices.

D. *What form a debate or consultation about the question should take and who should lead it?*

17. It is important that any consultation on such a major strategic change in research and innovation policy is well conceived through prior consultation and meeting with those with deep understanding of the research base and of innovation processes. A meeting with representatives of the academies (Royal Society, Royal Society of Edinburgh, Royal Academy of Engineering, Academy of Medical Sciences) with the Technology Strategy Board and Director General of Research Councils, could be a means of creating a well-developed concept before consulting the wider community.

April 2009

Memorandum 67

Submission from the BioIndustry Association (BIA)

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

"Has the time come for the UK—as part of a clear economic strategy—to make choices about the balance of investment in science and innovation to favour those areas in which the UK has clear competitive advantage?"

The BioIndustry Association is the trade association for innovative enterprises in the UK's bioscience sector, representing over 300 members involved in realising the human health benefits that bioscience promises.

Historically the UK has been at the forefront of biomedical innovation with a legacy of leading the development of innovative medicines that have transformed healthcare and brought real benefits to patients as well as increasing national wealth. Government has recognised the importance of bioscience to the UK's future prosperity in reports such as Lord Sainsbury's review of science and innovation in 2007 and DIUS' Annual Innovation Report 2008. However, there remain distinct threats and challenges ahead that must be overcome if UK bioscience is to deliver lasting improvements in healthcare and compete internationally.

Industry is committed to working with Government to implement the recommendations outlined in the Bioscience 2015 Review and Refresh report but we also urge Government to commit all it can to ensuring that UK bioscience is mobilised to exploit its knowledge and expertise and retain its competitive advantage.

The greatest problem the sector is currently facing arises from inadequate financing, exacerbated by the effects of the global economic crisis. As a result, many viable and innovative UK enterprises will face severe financial challenges in the coming months, which will have a negative impact on the innovation pace and the science base in the UK. Maintaining our success in the face of much competition from abroad will also depend on nurturing and developing a pool of highly talented bioscience professionals. This will need to be achieved by attracting and retaining the best current talent and supporting leaders of the future.

The BIA is very supportive of any approach that better uses the strategic role of Government in order to translate scientific excellence into economic impact by building a strong private sector. It is an approach to public policy that the Association feels has an especially important application to the UK bioscience sector and it is precisely the success of the bioscience sector—which has been recognised by Government as one of the UK's strengths—that will allow the UK to fight its way back from the current economic crisis.

The UK bioscience sector creates 21,500 high added value jobs and up to three times those numbers of jobs supported by the sector in the broader economy.[203] This does not even take account of the impact of the commercial sector in partnering with, and partly funding, research in universities, institutes and the NHS. Lord Mandelson acknowledged this during a speech in January 2009 when he said "Where are the jobs going to come from? Well, I've spent the last two months arguing that above all they need to come from a renaissance in UK manufacturing and the expansion of the UK's knowledge-based industries. . . bioscience, precision engineering and advanced electronic manufacturing. And, as I have said, the world class services sector that these industries need to be embedded in".

UK is genuinely grateful for everything that this Labour Government has done to support t bioscience he sector since 1997. From increased funding for scientific and medical research, to introducing tough, world-leading legislation to combat animal rights extremism, to most recently the establishing of the new Office for Life Sciences led by the Science Minister and former BIA Chair, Lord Drayson. Notwithstanding this support, the current economic climate poses the biggest challenge ever to face the sector. In November 2008 it was reported that over a third of listed UK bioscience companies are running on less than six months worth of cash[204] and in the current economic climate, this position has not improved. Therefore, encouraging the right environment in the UK is now more important than ever. The UK's bioscience sector faces some distinct threats and challenges that must be overcome if it is to continue to compete globally and fulfil its considerable potential—both in terms of improving outcomes for patients with new drugs and treatments and making a significant contribution to the UK economy as a leading example of Britain's growing knowledge economy.

The BIA has some major concerns, principally around the role of Research Councils in funding research and development undertaken by SMEs. The BIA understands that Research Councils are bound by their spending rules to fund only academic research and does not allow the funding of research undertaken by SMEs. As a result there is a lack of Research Council involvement in initiatives such as the Small Business Research Initiative (SBRI) in the same way as their US equivalents; therefore the value of such initiatives

[203] East of England International's *Biotechnology Overview* has noted how that region's concentration of hi-tech businesses has attracted "an unprecedented network of service providers to the area", including venture capitalists, high-calibre legal and accountancy practices, patent agents, management consultants and clinical trial professionals.

[204] KBC Peel Hunt Report "UK Biotech Sector"—25 November 2008.

is lost putting the UK at a distinct disadvantage. Clarification of how Research Councils can make use of initiatives such as SBRI to procure R&D from SMEs is needed.[205] There is real need for a shift in behaviour to ensure that British science and technology are at the heart of the revolutions in industrial production that will define the 21st century.[206]

On the 1 April 2009 at an oral evidence session to the House of Commons Innovation, Universities, Science and Skills Committee hearing, Iain Gray (Chief Executive) of the Technology Strategy Board (TSB) outlined their priorities over the next 12 months which included healthcare and regenerative medicine. It is gratifying to see Government.

Recognising both the potential of regenerative medicine and the importance of the wider bioscience sector to the health and prosperity of the UK. It is widely accepted that regenerative medicine offers the potential to deliver the next major source of innovation in healthcare, with all the associated benefits to patients such developments will bring. However, UK companies operating in this area are experiencing real issues in raising funds, such that groundbreaking research projects and clinical trials are under serious threat (Annex 1). Extreme investor nervousness is translating into lost opportunities for the UK. In a sector heavily reliant on investment to drive research and development, there is a desperate need for a willing partner to support such globally ground-breaking work through these tough times. Without support for commercialisation, this valuable and groundbreaking research will be lost not just to UK plc but to the UK's patient population.[207]

Finally and crucially, a successful life sciences sector needs more than a favourable financial, regulatory, and clinical environment; skills and human capital lie at the heart of successful innovation for public health. We need experienced management and high calibre scientists to deliver new medicines. Driving our commitment to work with Government is the reality that a successful UK life sciences sector is a critical element of the future knowledge economy and good for UK patients.

The BIA would strongly support any Government initiatives that look to protect and build on the industry that we have already in the UK, as well as ensuring that Government investment in life sciences so far is safeguarded and that the potential for economic benefit is fully exploited.

April 2009

Memorandum 68

Supplementary submission from Universities UK (UUK)

"PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY"

Universities UK is the major representative body for the higher education sector. It has 133 members who are the executive heads of the universities in the UK, and works closely with policy makers and key stakeholders to advance the interests of universities and higher education.

SUMMARY

1. Outlined below is our response to the policy signals sent by Government recently regarding strategic investment in science and innovation. Universities UK believes that UK university-based research is already geared to be responsive to economic changes and needs, and would urge recognition of existing efforts to foster high-impact research. The current balance of the existing dual support funding arrangement is vital to maintaining such an effective research base.

DEBATE/CONSULTATION ON INVESTMENT IN SCIENCE AND INNOVATION

2. In overseeing any debate or consultation, or in the formulation of final policy, we would hope that Government would not abandon its hitherto continued adherence to the Haldane Principle that research decisions should be made by researchers.

3. Universities UK would also hope that any consultation would involve universities from across the sector, not only those specialising in science and engineering. Lord Drayson reassured our members at the end of the February that when he talked of "science" he meant it in the European sense, that is, "knowledge" in all its forms. For good reason it has often been pointed out that a possible investment priority such as responses to climate change is an area on which research developments in the arts, humanities and social sciences, as well as sciences, must all be brought to bear.

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[205] http://www.rcuk.ac.uk/research/eligibility.htm

[206] Report from the Department for Business, Enterprise and Regulatory Reform (BERR)—'Building Britain's Future—New Industry New Jobs' April 2009.

[207] The Commercial Development of Cell Therapy—Lessons for the Future? Paul Martin, Ruth Hawksley, and Andrew Turner April 2009. http://communications.nottingham.ac.uk/SiteData/Root/File/Resources/Cell%20therapy%20survey%20-%20Part%201%20.pdf

THE NECESSITY AND DESIRABILITY OF SUCH A POLICY

4. Universities UK maintains that the existing funding framework is appropriate for a responsive and successful research base, and we would be wary of any substantial re-engineering intended to cater for immediate economic concerns.

5. We believe that the notable success of UK university-based research is due to its funding through the dual support system, which allows both direction at the broad level and responsiveness in the research base. The two main public sources of funding in dual support– the block grants to universities and the project-based research supported by the research councils—are different in nature, but equal in importance.

6. The block grant made to universities by the funding councils ensures a fertile and financially sustainable research base. Much effort has been made in recent years to rebalance the dual support funding to allow for this financial sustainability which is essential for a thriving research base, and we do not want this good work to be undone.

7. The block grants also do more than ensure financial sustainability: they provide institutions with the flex and ability to respond to new demands and challenges, allowing risky or more innovative research to be supported when it might otherwise slip through the net. Our 2006 publication, *Eureka*, conveyed how many unexpected but world-changing innovations and ideas have emerged from being given time to evolve in supportive research cultures. We simply cannot afford to miss these opportunities. All research areas rely heavily on this funding. The arts and humanities, which have great economic relevance through the creative industries, for example, is one such area.

8. It must also be remembered that, as well as being unpredictable, the impact of research can have long lead times—far beyond immediate economic concerns. A recent report from the Wellcome Trust, MRC and Academy of Medical Sciences shows that the time lag between research expenditure and eventual health benefits is around 17 years.

9. With regard to the funding of project-based research by the Research Councils, work is already underway by the Research Councils and HEFCE to help demonstrate and encourage the impact of research investment: Research Councils are building this into their grant process and HEFCE is considering how impact can be recognised within the REF framework. Universities UK is currently working with the Research Councils to explore how this direction is being pursued in other ways, for example, through academic promotion criteria.

10. We also support the cross-Research Council priority themes that seek to establish multi-disciplinary approaches that can address major societal challenges. These themes match with many of the key priority areas the Government have identified. Combined with the efforts to maximise impact of research funded by the Research Councils (outlined in the previous paragraph), this work has huge economic potential and we would welcome enhanced support for it. (Any enhanced support for project-based research however must always be matched by growth in the block grant for universities, for reasons outlined above).

POTENTIAL IMPLICATIONS FOR HIGHER EDUCATION

11. Again, Universities UK would be very wary of any attempt to skew the current balance in the dual support funding system. Attempts to focus research efforts any further would risk closing off the broad but vital contribution that a range of disciplines could make to key priorities such as climate change research, as already noted.

SECTORS THAT WOULD BENEFIT AND THOSE THAT WOULD LOSE OUT THROUGH SUCH A POLICY

12. Universities UK does not believe that Government should be "picking winners", not least because, where university-based research is concerned, this is far from an exact science. Such a government-led policy might also risk undermining cross-disciplinary collaboration, which is already recognised (by Research-Council allocations) as a common and important feature of some high-impact research in key priority areas such as climate change.

13. Again, we would urge policy-makers to recognise the success of the UK's research base, and to understand that its dynamism and responsiveness is due in no small part to the balanced dual support system that currently exists.

April 2009

Memorandum 69

Supplementary submission from the Royal Society of Chemistry (RSC)

RSC response to the Innovation, Universities, Science and Skills Select Committee call for Supplementary Eidence on Putting Science and Engineering at the Heart of Government Policy

1. Science has a vital role in contributing solutions to socioeconomic challenges such as climate change and providing evidence to inform policy decisions. Both of these roles must be supported by Government to maximise the societal benefits that science offers.

2. The RSC values the funding received by UK science and believes that this support must continue to reap benefits in the future. It is important to recognise that the nature of science means that investment in fundamental research is unlikely to lead to immediate benefits. The RSC also commends the efforts of the Government in supporting the use of science in policy-making, such as the appointment of Departmental Chief Scientific Advisers, and hopes to see further progress made in this area.

Leading the Debate

3. The IUSS Select Committee is in the best position to lead a debate on science strategy, since they have the powers to gather evidence from important stakeholders, including Ministers, and ensure a response from Government.

A UK and European Science Strategy

4. The UK is too small to be able to develop a sustainable, focussed strategy that also maintains excellence across a wide science base. UK science strategy should be developed in a European context in order to benefit from increased scale and improved collaboration.

5. The Haldane principle, that scientists not politicians should determine how research funds are spent, must be preserved and upheld.

6. The RSC believes that the breadth and quality of the UK fundamental research base should be strengthened. This will ensure that UK science is able to adapt to future changes in priorities and is well-placed to benefit from serendipitous discoveries. The excellent UK science base is an important part of the "innovation ecosystem"[208] but it is difficult to predict where the most significant innovations will come from within the science base. For example, the use of Magnetic Resonance Imaging in diagnostics was a product of decades of fundamental physics and chemistry research into the properties of atomic nuclei.

7. Science should remain a UK-wide activity that fully integrates the devolved authorities in order to capitalise on economies of scale. Directing research priorities within the UK may risk exacerbating tensions within the current devolutionary framework.

8. To prioritise science effectively, whilst minimising impact on the science base, a UK science strategy should be developed in the context of the European Research Area. Developing a Europe-wide science strategy could allow the whole region to direct funds to centres of excellence in specific areas, avoiding inefficient duplication of research and maintaining diversity in science.

9. The RSC does not agree with Lord Drayson's proposed prioritisation criteria and the driver for any selection must be societal need, not economic factors. The Joint Programming initiative in the European Research Area suggests that projects must address a pan-European or global socioeconomic or environmental challenge[209] and the RSC broadly supports this. Direct economic benefit is only one aspect of societal need and serving society more broadly could have indirect economic benefits, for example, through the mitigation of climate change.

10. The scale and critical mass provided by a Europe-wide science strategy would make the region genuinely competitive with the US and the emerging strengths of China and India. Collaboration within Europe will allow the development of a number of centres of excellence in a broader selection of areas than the UK would be able to do alone. Interdisciplinary work is vital and good collaborative networks of this kind will promote knowledge transfer. For example, the European Molecular Biology Laboratory (EMBL) provides a good model for a European collaboration in the form of a centre of excellence that focuses on a particular strategic area. EMBL has five research facilities spread across the EU and an excellent track-record and reputation in molecular biology research.[210]

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[208] Innovation Nation, DIUS, 2008.
[209] Towards Joint Programming In Research: Working together to tackle common challenges more effectively, 2008, Commission of the European Communities.
[210] http://www.embl.org

11. Under this model a proportion of the UK science budget would be contributed to the European Research Area in return for European research funds. The rest of the budget would be retained to support UK science. If the UK is able to provide a world-leading environment in which to undertake science it will be able to attract a disproportionately greater share of the European funding and researchers than its counterparts.

Potential Implications of a Science Strategy

12. A science strategy must encompass education, research, innovation and development in order to be effective. Within a wider European strategy the UK should aim to be world-leading in the exploitation of research and the quality of skilled people available to support science in academia and industry. Ensuring excellence in these areas will strengthen UK science and benefit the economy, for example by attracting business investment.

13. The UK must ensure that there is a sufficient supply of well-skilled people to fulfil demand from science industries and academia. An excellent education pipeline is required to ensure this supply. This pipeline requires good quality science education from primary school level through to higher education, through a balance of curriculum and excellent facilities and teaching staff. Vocational and skills-based training that fulfils science industry needs must also be provided in the UK.

14. The UK should aim to attract world-class researchers. Establishing world-leading centres of excellence in the UK, as part of a wider European strategy, is one means of doing this. The UK must have world-class research facilities and working conditions that attract and maintain excellent researchers from around the world.

15. The UK must ensure the effective exploitation of scientific research through innovation and the development of new products and processes. It is also essential to develop a supportive environment that maximises entrepreneurial activity; start-up and SME growth; and ensures that unexpected benefits or applications of research are not overlooked. Areas such as knowledge transfer, intellectual property and the availability of venture capital should be considered. By establishing a world-leading environment for innovation the UK will be well-placed to profit from its excellent science base.

Conclusion

16. How UK research funds should be divided between support of the fundamental science base and support of a European research programme must be carefully considered and decisions must not be taken on the basis of dogma or guesswork. Research should be undertaken to establish how the division of funding would affect UK science in the short, medium and long-term so that informed decisions can be made.

April 2009

Memorandum 70

Submission from the Centre for Sustainable Urban and Regional Futures (SURF), University of Salford

RESPONSE TO DIUSS SELECT COMMITTEE SUPPLEMENTARY CALL FOR EVIDENCE

> *"Has the time come for the UK—as part of a clear economic strategy—to make choices about the balance of investment in science and innovation to favour those areas in which the UK has clear competitive advantage?"*

Summary

— Developing a clear economic strategy in this area is problematic in the absence of systematic understanding about how knowledge exchange in different disciplines and sectors works.

— Choices about investments in science and innovation are made on sets of assumptions which include the relationship between excellence and relevance and the value attached to different forms of knowledge.

— There is a conflation between the vision of world class excellent science and particular economic outcomes, without any rigorous understanding of how expected benefits can be realised from different areas of knowledge—and the implications for major knowledge producers, among them universities.

— There are dangers in a short-term reaction to a global economic crisis without examining the underlying assumptions and deficits of policy.

— In particular, we are concerned that choices made as a result of sub-optimal policy-making processes will result in further concentration of resources and undermine the structural, institutional, disciplinary, spatial and industrial integrity of the research base.

— Careful consideration needs to be given to how opportunities are structured within a renewed policy of targeting to ensure benefits for the broadest base of the UK as possible.

— This might include, for instance, de-linking the thematic concentration of resource from a geographical or institutional concentration through novel networked, distributed or satellite forms of organisation and management. Incentives are needed not only to attract big private sector R&D actors, but to embed and share the benefits more widely across the industrial base.

1. Introduction

1.1 The Centre for Sustainable Urban and Regional Futures is a research centre at the University of Salford under the 6* BuHU Research Institute.[211]

1.2 This submission builds upon SURF's recent work on European multi-level science and innovation policy; the roles of universities in the knowledge economy and effective knowledge exchange between the research base and user communities.[212]

2. Statement of Response

2.1 *Has the time come?*

Recent policy pronouncements state that it is the context of the global economic downturn which has created the impetus for a debate on whether science and innovation policy should be more targeted to favour areas of "competitive advantage".

What is new is the idea that 'relevance' to economic competitive outcomes should be given greater priority in determining the broad areas to which funding should be allocated.

"Relevance" is seen as critical if science and innovation are to deliver on the expectation that they are stepping stones out of recession and springboards for success in the economic upturn.

2.2 *As part of a clear economic strategy . . .?*

How is this to be realised? Caution should be exercised in deploying grand assumptions concerning the power of science and innovation.

Our work has consistently highlighted a "missing middle" in knowledge exchange between research and user communities. We know "what" is required but an understanding of "how" the expected benefits of science and technology, across disciplines, can most effectively be harnessed and translated into economic, social and environmental gain, is not so developed.[213]

The "missing middle" relates to how policy levers, incentives and expectations of science and innovation fail to match up with the capacity to deliver. A linear, simplistic understanding of the relationship between research and practice continues to dominate.

2.3 *To make choices about the balance of investment in science and innovation . . .*

We have a policy of targeting. Choices have always been made about the balance of investment in science and innovation. Yet the criteria for such choices are not always clear, whether economic or scientific.[214]

Research on the formulation of policy processes at the Centre has highlighted the gap between the identification of new frameworks for action and the implementation of frameworks in action.[215]

Criteria for a further concentration of resources must be clear, defensible and coherent, from consultation through to implementation.

[211] For further information, see http://www.surf.salford.ac.uk.
[212] This includes in excess of 300 interviews over the past five years with science and innovation stakeholders within European, national and sub-national tiers of governance, industry and higher education.
[213] Perry, B and May, T (2006) Excellence, relevance and the university: the "missing middle" in socio-economic engagement. *Journal of Higher Education in Africa*, Vol 4, No 3, pp 69–92.
[214] For instance, in relation to the location of the DIAMOND synchrotron at Rutherford Appleton Laboratory, our research highlighted opaque policy processes and multiple lines of Government accountability. ESRC Grant, "Making Science History? The Regionalisation of Science Policy.", Award Number L144250004.
[215] Marvin, S and May, T (2003) City Futures: Views from the Centre. *City.* 7:2, 211–223.

"Choices" can only be as good as the knowledge they are based upon. Policy rhetoric tends to focus on a disembedded understanding of excellence, which conflates world-class, global excellence with particular kinds of scientific and largely technological knowledge.

Government reinforces a narrow view of scientific excellence that equates national actions with excellence and regional actions with relevance.

There is a dichotomy between excellence and relevance that needs to be overcome. New ways of building "excellent relevance" and "relevant excellence" for the UK's competitive knowledge base is needed through what we have termed "active intermediaries".

2.4 *To favour those areas in which the UK has clear competitive advantage?*

The dominance of the disembedded, global, world-class, 'science', excellence view of the world has the effect of devaluing other forms of knowledge, particularly, for instance, in the social sciences, arts or humanities, as well as physical sciences in other institutions and places.

Our work clearly highlights the diverse knowledge needs of a wide range of industries. Economic benefit is as much about sharing and integrating existing knowledge as producing that which is new. Open innovation has the potential for supply-chain benefits, but the issue of ownership and embeddedness of footloose multi-national R&D remains problematic.

We see an increasing stratification in the higher education sector between research-facing and business-facing universities, global players and locally-relevant actors, or between teaching and research institutions. This detracts from more developed understandings

There is an existing concentration of resources that favours centres of expertise across England. Further concentration could result in regions, cities and their universities increasingly vying for the same pots of money and thematic specialisms leading to duplication and few incentives for collaboration.

This could result in fragmentation and an increasing differentiation between the research "haves" and "have nots" in disciplinary, industrial, institutional and spatial terms.

There are not only issues of equity at stake, but inherent dangers in overconcentration, short-termism and a "strangling" of more bottom-up areas of research opportunity.

2.5 *A Way Forward?*

To address these issues require careful consideration through the following:

- a greater understanding of the contribution of different knowledges to economic, social and environmental challenges;
- further analysis on how mechanisms for knowledge exchange between the research base, industry and the public sector differ across disciplines and sectors;
- a more sophisticated awareness of the potential win-wins between national and regional involvement in science policy to bring excellence and relevance together; and
- the potential for more distributed, networked and open forms of research and innovation to ensure both excellence, relevance and address issues of institutional, spatial and industrial concentration.

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Submission from UK Space

SUMMARY

Space is one of the economic sectors with the highest added value, contributing ~£7 billion annually to the UK GDP. It is a hi-tech export-driven sector in which engineering and science blend together seamlessly to underpin a world-class sector growing at over 10% per annum. The space industry's level of investment is equivalent in monetary terms to 12% of the industry's value added (ie its GDP contribution). This means that the UK space industry is about six times more R&D intensive than the economy as a whole.[216]

Space provides several examples of best practice for government investment in science, such as:

- both civil and military space systems/services often benefit from a single government-sponsored R&D investment;

[216] Case for Space, Oxford Economics, November 2006.

— Government R&D funding has helped create a public sector "intelligent customer" for space systems and services—in Departments, Regulators and Agencies, and at both policy and implementation levels; and

— enlightened public sector procurement policy has turned small long term R&D investment into world-leading commercial services.

UKspace recommends that it is timely to use the above best practice as guidelines for future public sector investment in science. We would be pleased to elaborate on the aspects of public procurement that are most relevant in this debate.

Introduction

Space science (in its broadest sense, including Earth Observation, timing, navigation, telecommunications, biology and astronomy):

— Provides a challenging environment which forces the development of leading-edge technologies from the science base.

— Provides an intellectually rigorous environment for researchers which forces the advance in scientifically-based endeavours in the space domain.

— Underpins much commercial activity—directly as in broadcasting and positioning for example, and indirectly by contributing to the innovation environment in the nation as a whole.

— Provides a beacon for the education system to encourage children and students to develop an understanding of, and a desire to participate in, science and engineering.

We support the proposal for a review of science investment policy and recommend that it address how best to support the whole UK economy rather than individual narrower domains. We therefore recommend that the review be led by a scientifically-qualified economist, eg: from the Treasury.

Who are We?

UKspace is the Trade Association for the UK space industry. It is jointly sponsored by the SBAC and Intellect.

The Space Industry in the UK is one of the most innovative sectors of the UK economy and as such contributes to the wealth of the nation. It is a large employer of science and engineering graduates—nearly 60% of the industry's labour force is qualified to at least graduate level—compared to 30% for the economy as a whole.[217] Most companies have close links with Institutes of Higher Education and public sector laboratories, often supplying the tools for research in the various science disciplines making up space science.

Factual Information

Central Government spends £218 million in civil space directly coordinated by the British National Space Centre (BNSC),[218] predominantly from DIUS, DfT, DEFRA, TSB and The Met Office, and most of it through the European Space Agency (ESA) and Eumetsat. Through its contribution to the European Commission it spends significant additional amounts on GMES,[219] Galileo and other FP7 research activities.

One of the major reasons for UK participation in these international organisations is the scientific benefit that accrues. However, the organisational structures used by the UK for managing its participation in these international scientific endeavours often differs radically from those used by competitor countries (in particular in not having a UK Executive Space Agency).

Recommendations

UKspace believes that a review of science investment policy is required.

Whenever public sector funding for science comes under pressure, there is an understandable attempt to "pick winners" which will be commercially successful when spun out into industry. History shows that such attempts are usually failures; if the commercial value of a development is so obvious, commercial investment will be viable and the investor will not want to share the intellectual property with an academic institute.

This means that the public sector should invest in high-risk subjects where success is not guaranteed but where success would have major national-scale benefits.

[217] Case for Space, Oxford Economics, November 2006.
[218] UK Space Activities 2007, BNSC, July 2007.
[219] GMES = Global Monitoring for Environment and Security.

One of the benefits of a vibrant scientific sector is the cultural change which can be brought about in the nation as a whole, with the general public developing an appreciation of science and technology and reviving the Victorian perception that advances which affect everyone can be made in the UK, rather than only in Japan, the US, France etc.

Selecting the leader for such a review is difficult. Academics and industrialists will both inevitably bring a history of their domains and will be open to accusations of bias. Our recommendation is that a scientifically qualified economist (eg from the Treasury) may be the most appropriate, able to consider such important issues as:

- Given the global mobility of scientists, knowledge and capital, how can UK scientific investment be best framed to maximise the benefits to the UK economy and society?
- Given that other countries have a similar requirement and will also be trying to take benefits from UK investment, what actions can the UK take to maximise the benefits to the UK of the investments of other countries?)
- When science is done, where does the economic benefit fall? In volume manufacturing of commercial products, some probably falls where the factory is, but some also falls where the R&D site is.
- Where is the tax take that results from HMG subscriptions to international scientific organisations such as ESA, CERN, ESO, ITER, . . .?
- Since scientific investment may take decades to have noticeable economic effect, how can science investment policy be arranged to drive the speed of developments and sustain funding over those extended periods?

Above all we whole-heartedly endorse Lord Drayson's suggestion to favour science investment in areas where the UK has clear competitive advantage. In the case of space science, the evidence for competitive advantage can be clearly seen in the successful, growing, hi-tech, export-driven space industry.

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Supplementary submission from the Biosciences Federation (BSF)

Introduction

The Biosciences Federation (BSF) is a single authority representing the UK's biological expertise, providing independent opinion to inform public policy and promoting the advancement of the biosciences. The Federation was established in 2002, and is actively working to influence policy and strategy in biology-based research—including funding and the interface with other disciplines—and in school and university teaching. It is also concerned about the translation of research into benefits for society, and about the impact of legislation and regulations on the ability of those working in teaching and research to deliver effectively. The Federation brings together the strengths of 45 member organisations (plus nine associate members), including the Institute of Biology. The Institute of Biology is an independent and charitable body charged by Royal Charter to further the study and application of the UK's biology and allied biosciences. It has 14,000 individual members and represents 37 additional affiliated societies (see Annex). This represents a cumulative membership of over 65,000 individuals, covering the full spectrum of biosciences from physiology and neuroscience, biochemistry and microbiology, to ecology, taxonomy and environmental science.

Has the time come—as part of a clear economic strategy—to make choices about the balance of investment in science and innovation to favour those areas in which the UK has a clear competitive advantage?

1. To a large extent UK research funders already prioritise part of their research investment portfolio. Furthermore, most of the scientific community accepts that taxpayers should expect to see an upside from their investment in research. This is really question about how much further the UK should proceed in the direction of prioritising research activity at the expense of response mode "bottom up" funding.

What form a debate or consultation about the question should take and who should lead it?

2. This will rapidly evolve into an argument for additional funding in areas where the exponents will claim that much opportunity will be lost without further focussed investment. The potential conflicts of interest are large and have to be avoided if the community is to retain faith in the integrity of the decision making.

3. We consider that there should be an international dimension to the consultation—preferably with input from a significant overarching organisation. The Japanese Society for the Promotion of Science, the US National Science Foundation and the European Science Foundation are all examples where useful input about the accuracy of claims made within the UK could be checked.

4. In addition, balanced input could be obtained from UK Learned Societies and organisations like HUBS (Heads of University Biological Science Departments). Yes, they will have vested interests, but they are in a good position to make priorities within their limited interests.

5. The consultation should be as wide, open and transparent as possible. If this is achieved, who leads it is less important.

6. Finally, we believe that directed (prioritised) research has been undertaken for sufficient time for a good quantitative case to be made for or against the proposition. Is there any evidence to suggest that, in biology at least, that directed research gives better dividends (£ for £) than response mode? If there is, we haven't seen it: if there isn't, it should be sought.

Whether such a policy is desirable or necessary

7. It may be essential in order to maintain good funding levels but whether it is desirable depends entirely on the consequences.

What the potential implications of such a policy are for UK science and engineering, higher education, industry and the economy as a whole

8. The BSF believes strongly that if we only focus on what we think we are good at today, we will be good at very little tomorrow. The future health of our science base requires that response mode funding is always sufficient to nurture the most able.

9. Furthermore, the UK is already in a position where prioritisation and the rewards for obtaining big grants, has led to a loss of capacity in key subjects. Examples include toxicology, fresh water biology and taxonomy; in the latter case we will soon be relying on gifted amateurs to monitor climate change. Increasing the focus of research and innovation is likely to lead to a change of teaching focus in Universities and further damage subject areas that are below the radar but nonetheless critically important for the UK economy. And teaching, of course, refers to all levels but perhaps especially the postgraduate level because this is the source of most of the future experts.

10. Even if the foresight for prioritised investment is excellent, the upside to the economy will not appear without action all along the translation route. In particular, we are concerned that in the biosciences, where delivery timelines can be long, there remain significant funding gaps for early and mid stage companies.

And were such a policy pursued, which research sectors are most likely to benefit and which are most likely to lose?

11. This obviously depends on the size of the sector but the 21st century is the age of biology and we have only just started to exploit the major discoveries of modern biology. However in many ways biology has changed and increasingly needs to interact with chemists, mathematicians, engineers and physicists. For biology to flourish and deliver its potential, the strength of other sciences is critical.

12. The law of unintended consequences is always demonstrable.

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Annex

MEMBER SOCIETIES OF THE BIOSCIENCES FEDERATION

Association for the Study of Animal Behaviour
Association of the British Pharmaceutical Industry
AstraZeneca
Biochemical Society
Bioscience Network
British Andrology Society
British Association for Psychopharmacology
British Biophysical Society
British Ecological Society
British Lichen Society
British Mycological Society
British Neuroscience Association
Experimental Psychology Society
Genetics Society
Heads of University Biological Sciences
Heads of University Centres for Biomedical Science
Institute of Animal Technology
Institute of Biology
Institute of Horticulture
Laboratory Animal Science Association
Linnean Society
Nutrition Society
Physiological Society
Royal Microscopical Society

British Pharmacological Society
British Phycological Society
British Society of Animal Science
British Society for Developmental Biology
British Society for Immunology
British Society for Matrix Biology
British Society for Medical Mycology
British Society for Neuroendocrinology
British Society for Plant Pathology
British Society for Proteome Research
British Toxicology Society
Royal Society of Chemistry
Society for Applied Microbiology
Society for Endocrinology
Society for Experimental Biology
Society for General Microbiology
Society for Reproduction and Fertility
Syngenta
Universities Bioscience Managers Association
Environmental Mutagen Society
Zoological Society of London

Associate Member Societies

Association of Medical Research Charities
BioIndustry Association
Biotechnology & Biological Sciences Research Council
GlaxoSmithKline
Medical Research Council
Merck, Sharp & Dohme
Pfizer
Royal Society
Wellcome Trust

Additional Societies represented by the Institute of Biology

Anatomical Society of Great Britain and Ireland
Association for Radiation Research
Association of Applied Biologists
Association of Clinical Embryologists
Association of Clinical Microbiologists
Association of Veterinary Teachers and Research Workers
British Association for Cancer Research
British Association for Lung Research
British Association for Tissue Banking
British Crop Production Council
British Inflammation Research Association
British Marine Life Study Society
British Microcirculation Society
British Society for Ecological Medicine
British Society for Research on Ageing
British Society of Soil Science
Fisheries Society of the British Isles
Freshwater Biological Association
Galton Institute

Institute of Trichologists
International Association for Plant Tissue Culture & Biotechnology
International Biodeterioration and Biodegradation Society
International Biometric Society
International Society for Applied Ethology
Marine Biological Association of the UK
Primate Society of Great Britain
PSI—Statisticians in the Pharmaceutical Industry
Royal Entomological Society
Royal Zoological Society of Scotland
Scottish Association for Marine Science
Society for Anaerobic Microbiology
Society for Low Temperature Biology
Society for the Study of Human Biology
Society of Academic & Research Surgery
Society of Cosmetic Scientists

Society of Pharmaceutical Medicine
Universities Federation for Animal Welfare

Additional Societies Represented by the Linnean Society

Botanical Society of the British Isles Systematics Association

Memorandum 73

Supplementary submission from the Association of Medical Research Charities (AMRC)

The Association of Medical Research Charities (AMRC) is pleased to submit supplementary evidence to the Innovation, Universities, Science and Skills Committee inquiry: *"Putting science and engineering at the heart of Government policy."*

Prioritisation

AMRC welcomes the debate recently initiated by the Science Minister, Lord Drayson, on whether the UK should identify those areas of science and innovation in which the UK has clear competitive advantage and invest accordingly. In general terms, we support the notion that it is important to focus on those areas where the UK is, or has the potential to be, a leader and/or secure the greatest public benefit. We would argue strongly that medical and health research is one of those areas.

Notwithstanding this, and in order for such a debate to be constructive, we believe that the Government needs to be very clear about its desired outcomes for taking this course and the criteria by which it would propose defining "competitive advantage." It must also address 'cultural' and other factors it believes are important contributors to the UK's success to date and its future performance. Naturally, we would argue strongly that a strong and viable research charity sector is one such feature.

Medical and Health Research

The Committee will be aware of the fact that the Office for the Strategic Co-ordination of Health Research (OSCHR) is conducting its own exercise to identify "National Ambitions" and "Research Opportunities" in medical and health research. Many of our member charities have been involved in the various consultations it has undertaken to identify these and we applaud the fact that OSCHR has been clear from the outset about the underlying principles of this exercise as well as the anticipated framework within which its conclusions will be set (ie ensuring the right balance between basic versus translational research).

In sum, we believe that OSCHR's approach has been important in assuaging concerns thus far about the consequences of such an exercise for particular areas of research, and provides a useful model for how a similar exercise could be conducted across the breadth of science and innovation and within particular fields.

Economic Downturn and Impact on Charities

A key driver behind recent Ministerial statements has, of course, been the economic downturn. Medical research charities are not immune from the impact of the recession and it would perhaps be helpful to the Committee's deliberations to have sight of some of the findings of an AMRC survey of its members conducted in March about the impact of the recession on their research funding. The full results will be published next month.

- The overwhelming majority of AMRC's members (76.6%) describe the effect of the downturn on their charity as either very significant (12.5%) or significant (64.3%).
- Over a quarter of medical research charities (25.9%) are planning to reduce their research funding in 2009-2010. Over half (51.9%) are planning to keep research funding at the same level as for the previous year and just under a tenth (9.3%) of respondents are planning to increase their research funding.
- Two-thirds of AMRC's members are considering co-funding opportunities (63.9%) as a way of mitigating the impact of the economic downturn. Also under consideration are: cutting administrative costs and streamlining processes (47.2%) and delaying grant rounds/restricting funding streams (44.4%). Over a third were thinking of reducing the number of grant rounds (36.1%).

Charity research funding is a vital component of the dual support system for ensuring the sustainability of university research. In 2008–09 AMRC's members spent £936 million (one third of all public expenditure) on medical and health research across the UK, and over 70% of this went to Higher Education Institutions (HEIs).

Based on these findings we believe that there will be a significant and worrying drop in research funding by medical research charities in 2009–10 and a knock-on impact for HEIs which is likely to continue into the following year if not beyond. This can only add to the uncertainties and pressures being felt by universities, institutions and their research staff and hinder their competitiveness.

Charity Research Support Fund (CRSF)

Against this background we support the calls that have been made by others for a coherent and ongoing Government effort to support science as a key part of its strategy for the UK to emerge strongly from the recession, beginning with this year's Budget Statement. And it must recognise the different components that currently contribute to the UK's competitiveness.

In our view this strategy must recognise the pivotal role played by medical research charities in supporting quality research if charity funding is to remain a strong income stream for science in the future. To achieve this the Government must commit to the long-term future of, and appropriate funding for, the Charity Research Support Fund (CRSF) which it established in 2004 to assist universities in covering a proportion of university overheads incurred on grants awarded by charities. As one of our member charities said in response to our survey:

> *"If, as reported in the news, the Government is considering a stimulus package for science, including additional support for the Charity Research Support Fund would . . . recognise [Sic] the excellence of charity-funded research and contribute to university sustainability and planning."*

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Supplementary submission from GeneWatch UK

The Committee has requested evidence on Lord Drayson's proposal that the UK should make choices about the balance of investment in science and innovation to favour those areas in which the UK has clear competitive advantage.

GeneWatch UK welcomes the Committee's call for evidence on this important issue. Our responses to the Committee's questions are below.

Q1. *What form a debate or consultation about the question should take and who should lead it*

GeneWatch strongly welcomes the Committee's suggestion that there should be public debate and consultation about investment in science and innovation, and whether or how this should be prioritised. Some key principles for effective participation have been highlighted in the EC-funded report "Participatory Science and Scientific Participation", which has already been circulated to members.[1] However, one of the key findings of this report is that there is no point consulting if there is no intention of actually changing decisions. The exact mechanisms for public engagement in decision-making are irrelevant when people are well aware that major decisions are being taken long in advance of any public consultation: this must be addressed if debate is to be meaningful.

The Government has been committed to a "knowledge-based economy" since 1997. This has included a secret commitment to building a genetic database in the NHS since at least 1999. Hidden choices about the balance of investment in science and innovation were made more than 10 years ago, when a small circle advisors from the biotech and nuclear industries were appointed to various government "competitiveness" task forces.[2, 3] The same people advised the Government to throw away any old-fashioned ideas about policy evaluation and to treat anyone who questioned anything as "anti-science" or "anti-technology".[4]

These people aim to achieve:

- surveillance of entire populations (the "database state");
- control of the world's food supply (via patents on seeds, plants and animals); and
- control of the world's energy supply (including uranium and coal).[5]

Examples of exaggerated promises include:[6]

Human Genome Screening

The idea of screening people's genes and targeting lifestyle advice or medication at people who are "genetically susceptible" was invented by scientists funded by the tobacco industry, who wanted people to believe (falsely) that lung cancer was in their genes.[7] It has since been backed by the pharmaceutical, food

and private healthcare industries, who want to expand the market for medication and new "functional foods" to rich, healthy people. However, genes are poor predictors of most diseases in most people and no common genetic variations exist which meet medical screening criteria.[8]

The Purple Genetically-modified (GM) Tomato

The widely promoted "cancer preventing" genetically modified tomato, contains enhanced levels of an antioxidant called anthocyanin. Claims about health benefits have been based on a single study conducted in mice. Yet a recent Cochrane review of medical evidence found that most early studies of better tested antioxidants had been wrong and that there was no evidence of benefit and some evidence of harm. The claims about the tomato have been criticised by Cancer Research UK,[9] scientists at the FSA and the NHS.

Feeding the World with GM Crops

GM Golden rice—the much-hyped solution to vitamin A deficiency in children—was only donated to poor farmers after two major clinical trials (published in 1994 and 1996) found that its main ingredient, beta-carotene, increased the risk of cancer in smokers and asbestos workers. Its advocates have never properly assessed either its benefits or its potential harms.

In December 2007, former Chief Scientist Professor Sir David King admitted that a project he had claimed was using GM crops to help farmers in Africa, was in fact not using GM plants at all, but agro-ecological farming methods.[10]

In this context, it is not surprising that the Science Horizons project identified a *"striking trust deficit"* and found that some people saw expert priorities for research investments as inevitably not the same as those of the average citizen.[11, 12]

Q2. *Whether such a policy is desirable or necessary*

Governments and companies have always influenced decisions about the balance of investment in science and innovation. Lord Drayson is being more open about these commitments in order to secure more subsidy, now that it is clear that Government's massive investment in a biotech economy has been an expensive failure. The increased transparency is welcome, but accountability is lacking.

Research by the Harvard economist Professor Gary Pisano—conducted before the current economic crisis—has shown that even floated biotech companies, let alone small spin-out companies backed by venture capital, have brought no benefit to the global economy, and without the largest US company, Amgen, have overall made steady losses for over 30 years.[13] He concludes that *"it is virtually impossible to find other historical examples, at least at the industry level, for which such a large fraction of new entrants can be expected to endure such prolonged periods of losses and for which the vast majority may never become viable economic entities"*. The entire industry was built on convincing venture capitalists that Intellectual Property (IP) could be bought and sold independently of the final product—leading to George Poste's infamous claim that *"genes are the currency of the future"* (followed by lobbying by him and others for the adoption of gene patenting in Europe). The expansion of the patent system is widely recognized to have stifled innovation and most biotech's are expected to go bust because they have no products.

Drayson's latest idea is to pour yet more money into exploiting electronic medical records linked to DNA (another idea first proposed by Poste). This would be a disaster for health, for the NHS and for the privacy of the entire population.[14]

It is therefore highly undesirable that the Government continues to pour money down the biotech drain without any kind of independent assessment of the unsubstantiated claims that this will deliver health benefits, save money or kick-start the economy.

However, this does not mean that the Government should not make choices about the balance of investment in science and innovation—it already does. What needs to happen is for these decisions to be made more democratic and accountable.

The overall effect of the policies adopted to promote the knowledge-based economy has been to weaken accountability for significant investments in research and development, which are determined neither by free markets (which have rejected GM foods and nuclear power, and are likely to reject human genome sequencing), nor by democratic institutions.

Our previous submission to the Committee's inquiry highlighted the issues that need to be addressed.

Q3. *What the potential implications of such a policy are for UK science and engineering, higher education, industry and the economy was a whole*

If decisions continue to be made by a narrow circle of vested interests, this is likely to exacerbate the damaging trend towards "hypothesis-free science" and the creation of a technocratic education system, at the expense of theory.

For example, it is possible to demonstrate that the complexity of biology and the important roles of choice, chance and social, economic and environmental factors in complex diseases put real limits on the predictability of complex diseases and the likely utility of genetic "susceptibility" testing, using existing data.[8, 15] But this requires some theory, rather than the type of genetic research that can be done by robots.[16]

Q4. *Were such a policy pursued, which research sectors are most likely to benefit and which are most likely to lose*

If decisions continue to be made by a narrow circle of vested interests, they will continue to decide who wins and loses—except this trend will be exacerbated by an even stronger concentration of public money in the biotech, nuclear and surveillance sectors (borrowed at the expense of future generations, who will have to deal with the social and environmental legacy and repay the debt). Sectors likely to lose out are the same ones that lose out now, ie anything that does not contribute to the three aims outlined above (control of personal data, DNA and the health market; control of global seed supplies; control of global energy). Examples include: agro-ecological faming methods and public health research and anything that requires actual thinking or learning as opposed to data-mining.

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Memorandum 75

Supplementary submission from the Campaign for Science and Engineering (CaSE)

1. The Campaign for Science & Engineering (CaSE) welcomes the Committee's call for supplementary evidence on the government's proposed agenda to focus the UK's research effort.

Consultation

2. Since the idea was first floated by Lord Drayson at the Committee's evidence session with him it has undergone various iterations. CaSE has followed ministerial speeches about or referring to the research "focus" agenda. Although having an open debate about policy is a laudable aim, the process by which this debate has been enacted has left much to be desired.

3. The current state of the debate is unclear. Although "focus" has been referred to in a number of speeches. Speeches by Lord Drayson and John Denham MP contained references to focusing funding on certain areas at the expense of others. Although the Prime Minister mentioned focus, he said that investment in science would rise across the board. Due to a lack of clarity about what is at stake this debate has consisted of speculation about potential impacts rather than substantive discussions about how to develop science and engineering during the economic downturn.

4. If the government is going to pursue this debate any further it needs to draft a consultation paper setting out proposals and their potential implications. The set of questions needs to be wider than the single proposal of focusing research effort. The science budget has already been allocated until 2010/2011, so there is time for a consultation process on the government's science policy prior to the next comprehensive spending review.

Industrial Policy

5. The origins of this debate appear to stem from discussions about creating a new industrial policy, which was launched on 20 April 2009 with the title *New Industry, New Jobs*. The policy statement made a number of proposals on increasing the economic impact of the research base through grant assessment, the Research Excellence Framework and the Technology Strategy Board. There needs to be policy debates about developing those proposals. However, there was no mention of re-focusing research funding on priority areas.

6. The general thrust of the industrial policy is to join up government activities, including procurement and regulation, to support particular sectors so that they are better supported. One of the key initiatives was the creation of the Government Office of Life Sciences, intended to bring various departments together to create greater coherence between policies affecting the pharmaceutical and biotechnology sector. If this proves to be a successful method to support priority technology areas then it should be expanded to other sectors. Government department R&D should be included within discussions about how to promote innovation within relevant sectors.

Focusing the UK's Research Effort

7. There are a number of serious flaws in thinking that the UK or certain sectors would benefit from narrowing the focus of the research base, because:

- It is hard to predict where major advances in certain sectors are going to come from as they are not always in the disciplines that would be expected.
- New discoveries and innovations often occur at borders between subject disciplines and thus depend on a breadth across disciplines rather than focusing on already established and recognised areas.
- Once resources are drawn down in an area it is difficult to build them back up again to respond to emerging challenges or technological opportunities.
- Students pursue science, technology, engineering and mathematics (STEM) subjects due to an excitement for a particular field. If particular areas are identified as not being nationally important by government it would undermine their drive to increase students taking STEM subjects.

8. Although science and engineering research is vital to many areas of economic activity, it also has a broader impact on society through improving environmental protection, cultural advancement, policy advice and human well-being. Even during a recession it is important that policymakers remember that "economic impact" is meant to encompass a wide set of issues.

9. Through the *10 Year Framework on Science and Innovation Investment Framework* the government has provided policy clarity and continuity for science and engineering. The government should build upon this record and not undermine it by creating instability in research funding by having a debate about priority areas. It could risk losing talented researchers and mobile corporate R&D to other countries who are making considerable investments in R&D through the economic downturn.

10. The government currently focuses the UK's research effort through allocating different funding levels to the research councils. It also adopted new measures in the last science budget allocation to focus research in certain areas through cross-council research programmes and requiring research councils to fund projects through the Technology Strategy Board and Energy Technologies Institute. These new initiatives should be reviewed before further resources are re-allocated to them.

11. To better inform debates about the allocation of research funding, there should be independent "health" checks of disciplines and the publication of statistical data relating to the portfolio of research investments. There should also be greater consultation and transparency regarding the science budget allocation.

Conclusion

12. The breadth and strength of the UK's research base is one of the nation's greatest assets. It provides the space for developing innovative technologies and the ability to understand and respond to new challenges. The government is looking to support initiatives to re-balance the economy, because it is all too apparent that reliance on a few sectors makes a system more vulnerable. The government should learn this lesson and strengthen the research base across the board.

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Memorandum 76

Submission from AMEC

1. This evidence is being presented by AMEC to the IUSS Committee's call for supplementary evidence on "Putting Science and Engineering at the Heart of Government Policy".

2. AMEC is the largest UK-based private sector supplier of technical engineering services to the nuclear sector. The business builds on AMEC's 50 years experience in the UK nuclear market. Half of our nuclear business is now international with a wide client base covering nuclear utilities, vendors and regulators in Canada, Europe and the former Soviet Union, South Africa, Japan and Korea. AMEC is committed to maintaining its position as the leading UK engineering company servicing the growing UK and global nuclear market. In addition, AMEC supports and is developing the conventional and renewable power sectors with projects on wind farms, biofuels, clean coal technology and carbon capture.

3. Views are presented against the four areas requested.

What form a debate or consultation about the question should take and who should lead it

4. The debate should be centred around achieving a transformational change in the UK's position in the shortest achievable timescale, given different competing funding priorities. We would propose a 10 year roadmap is established with interim key progress targets to improve the UK's commercial competitiveness in a global marketplace. This would suggest lead ownership by BERR to engage with key industry consultation and collaboration to establish priority areas where the UK can establish true competitive advantage, and to provide a focus where DIUS can develop the supporting innovation and skills platform.

5. Such a debate needs to review major global scientific challenges which would encompass energy, water and health sectors as leading candidates arising from climate change and socio-economic development issues.

Whether such a policy is desirable or necessary

6. As a leading UK applied engineering consultant and engineer in high technology disciplines serving a global market, it is essential for our commercial success that the UK continues to be seen as a high value added centre for scientific and technical development. The UK must also improve its reputation at converting scientific developments into successful commercial applications. AMEC therefore strongly supports Lord Drayson's objectives behind a policy. However clear actions and accountabilities must be placed to ensure that a policy delivers through to the benefit of the UK

What the potential implications of such a policy are for UK science and engineering, higher education, industry and the economy as a whole

7. The strength of AMEC's position in the global nuclear market has been driven by previous UK Government scientific investment into developing a significant nuclear capability in the early days of commercial nuclear power applications. We have taken this on to engage in international collaborative programmes where UK nuclear skills are still viewed as significant, whilst investing in technology

developments which have potential global applications rather than UK specific selected technologies. Not engaging with international developments was one of the historical mistakes made which has given nuclear technology development a tarnished reputation in the UK.

8. A global nuclear renaissance is occurring where the UK's currently limited volume but highly respected skills are in demand. Much of this growth potential is coming from countries where responsible people were originally trained by UK universities.

9. This gives the potential for the UK to be an independent leader in the nuclear sector. However we must recognise that other countries skills are also developing and we need to invest more to maintain our lead in technologies for the future. AMEC provided evidence to the DIUS consultation on Engineering: turning ideas into reality on the potential benefits and some of AMEC's recommendations have been reflected through in the report's conclusions, such as engaging in fourth generation reactor developments.

10. Such activities can provide opportunity across all sectors from basic research through to industrial application. Important to underpin this is the continued development of high technology research sites, which establish world leading reputations. JET has done this for the fusion programme but will be overtaken by ITER. The UK should consider re-engaging as a host country for future technical demonstrations, such as DEMO for the fusion programme, or a prototype generation IV reactor. Such investment has significant spin-off benefits across academia and provides opportunities for SME's behind larger engineering organisations, as well as providing a world-leading profile through flagship project success. An example of this is being demonstrated by DIAMOND.

WERE SUCH A POLICY PURSUED, WHICH RESEARCH SECTORS ARE MOST LIKELY TO BENEFIT AND WHICH ARE MOST LIKELY TO LOSE

11. This would be based on prioritisation taking advice from different industry sectors against the criteria laid out in Gordon Brown's speech of 27 Feb in Oxford where he stated *"Our approach is not that of picking winners or protecting existing industry from the market. Rather it is a clear strategic assessment of our future—based on the strengths and comparative advantages that Britain already has—to create a framework for prioritised long-term investment which allows the market to function effectively and prepares our country to emerge from the downturn in the strongest possible position."* AMEC views that this does entail the selection of preferred technologies to invest in and that the clean energy sector provides a significant opportunity. The UK has a strong capability developing in renewables and potentially in clean coal technologies as well as a strong independent nuclear heritage which can become the basis of future high technology global success where demand is significantly growing.

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Memorandum 77

Submission from the Natural Environment Research Council (NERC)

1. The Natural Environment Research Council (NERC) is one of the UK's seven Research Councils. It funds and carries out impartial scientific research in the sciences of the environment. NERC trains the next generation of independent environmental scientists

2. Details of NERC's Research and collaborative centres and Major Programmes are available at www.nerc.ac.uk.

3. NERC comments are based on input from Swindon office staff.

OVERARCHING QUESTION

> "Has the time come for the UK—as part of a clear economic strategy—to make choices about the balance of investment in science and innovation to favour those areas in which the UK has clear competitive advantage?"

Q1. *What form a debate or consultation about the question should take and who should lead it*

1.1 The debate needs to consider the whole of the supply chain and all points at which benefit are delivered to the UK economy. So, whilst it is sure to be important to understand the relevant commercial markets, issues such as avoided cost by better environmental policy, and the stimulus that regulation could bring to delivering a "green economy" need to be embraced.

Q2. *Whether such a policy is desirable or necessary*

2.1 Currently although broad statements have been made about research focus, it is not clear what the government's expectations are for where the UK needs to be, what the UK already does and what the gap is that will need to be met.

2.2 The research councils have focused on six interdisciplinary areas of research through the cross-council programmes (for example, Living With Environmental Change), each of which use excellent research to tackle major challenges for society. They draw on a range of users including business in co-designing programmes through to exploitation of research knowledge.

2.3 NERC focuses most of its research funding strategically. This takes into account what the key scientific challenges are and what societal and economic outcomes may derive from these, using the world-leading scientific capabilities that the UK has developed. Also importantly, NERC maintains responsive funding to identify emerging priorities for the future and train the next generation of scientists—these roles for responsive funding are strategic in their own right, without the need to be thematically focussed.

Q3. *What the potential implications of such a policy are for UK science and engineering, higher education, industry and the economy as a whole*

3.1 Whilst there are positive benefits for the UK in focusing on key economic areas of competitiveness, there is also a need to look to the future and take advantage of the development of new knowledge and new capabilities that may develop emerging economic opportunities.

3.2 It needs to be clear that not all research that is undertaken has a direct economic impact. Research is needed to provide evidence on broader issues such as regulation, policy-making, quality of life, societal outcomes.

Q4. *Were such a policy pursued, which research sectors are most likely to benefit and which are most likely to lose*

4.1 For the environment sector, there is a major opportunity to combine our leadership in prediction of environmental change, with our technology and engineering skills, to contribute to a successful, new green economy:

— developing and implementing technologies and solutions that ensure environmental sustainability;

— making optimal use of natural resources and processes; and

— understanding environmental constraints and the process of environmental change.

4.2 Doing so successfully needs a very broad range of skills across the environmental science and engineering disciplines and beyond—and so there is a significant opportunity for extensive engagement, rather than the risk of communities losing out. A particular opportunity for the UK is to capitalise on our skills in predicting environmental change by developing new markets in the area of environmental information services—"seeing the future" of the environment on business sensitive time and space scales.

4.3 It is notable that other nations which have prioritised the green economy (for example, Denmark, Germany and Spain, and no doubt soon the US) have already seen their businesses take a major market stake in relevant sectors (for example, offshore and onshore wind energy generation).

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Memorandum 78

Supplementary submission from UK Deans of Science (UKDS)

1. The UK Deans of Science (UKDS) has members in around 70 HE institutions that have significant science portfolios. Our primary aim is to ensure the health of the science base of the UK through the promotion and support of science and scientists and of science research and science teaching in UK HEIs. We welcome this extension of the Committee's inquiry as it reaches the very "heart" of the matter.

2. It is understandable that the Government wants to ensure that its investment in science leads to new products and services, medical and other advances, and major exploitation of intellectual property. We support the transfer of scientific knowledge to business, industry and the wider community and in particular in support of the UK economy during these challenging times.

3. This submission responds to three of the questions raised by the Committee. In summary we would wish to make the following points, which are further elaborated in paragraphs below.

- A "great debate" needs to be conducted in as wide an arena as possible as to how best to turn scientific invention into economic and social good and whether the best way to achieve this is through central control of the direction of scientific research and development (paragraph 4).
- It is not desirable to favour investment in some areas of research to the exclusion of others. Over-direction of the research agenda will fail to make the UK the country of choice for the best researchers (paragraph 5).
- Government should not dictate the direction of research in universities. Any attempt to do so will undermine their essential autonomy and does not accord with principles of the Bologna Declaration (paragraph 6).
- Universities are pursuing a range of ways of interacting with business but best practice needs to be identified and disseminated (paragraph 7).
- Universities must retain their distinction from businesses (paragraph 8).

4. *The form of debate or consultation that should take place and who should lead it*

There are various meetings between small numbers of members of the various stakeholders and occasionally a "consultation" inspired by the Government or other organisation. We suggest a different type of discussion where a large number of interested parties (Government, universities, industry, even the financial sector) meet face to face with a completely open agenda to consider:

- the best ways to turn scientific invention into economic and social good and who should be responsible for doing so; and
- whether (not how) the Government's funding should be targeted to perceived competitive advantage.

Such a meeting would have enough talent to discuss the real questions—if it is possible to pick winners; whether or not the UK has a competitive advantage in particular fields; whether it might be appropriate to favour specific areas of research and development.

5. *Whether it is desirable or necessary to favour investment in some areas*

Universities must be accountable for research funding whether from Government or the many other organisations that support their work. It is also right for universities to work with business, to maximize the financial and social benefits of their inventions and intellectual property and to encourage staff to consider the appropriate application of their research. However, we do not believe that the best way to nurture and support research talent in our universities is for Government to prescribe the areas that will be supported. Such a policy incorrectly assumes that the outcomes of research can be predicted—a non sequitur—that no completely new areas of research are going to be discovered and that breakthroughs can be predicated in advance even for the most fuzzy, complex, multi/interdisciplinary problems. Over-direction of the research agenda will drive the best researchers from the UK and mean will fail to attract the best from around the world.

6. *Potential implications for UK science and engineering, higher education, industry and the economy*

We note the request to limit this response to 1000 words, so make just one comment—in respect of universities and the Government's acceptance of the Bologna Process. The Process has its roots in the Magna Charta Universitatum Europaeum (1988) which was signed by Rectors of about 400 universities following celebrations marking the 900th anniversary of the University of Bologna. It states, *inter alia*:

- *The university is an autonomous institution . . . its research and teaching must be morally and intellectually independent of all political authority and economic power;*
- *Freedom in research and training is the fundamental principle of university life, and governments and universities . . . must ensure respect for this fundamental requirement.*

These expectations of the independence of universities are explicitly referred to in the Bologna Declaration, signed by the UK and 28 other countries in 1999, and the basis of the Bologna Process. Any further dilution of the Haldane Principle and the imposition of defined research agenda for universities may put the UK outside the Bologna agreement and the European Higher Education Area.

7. Universities are not all the same. They increasingly pursue their own distinctive character but are distinct from business and industry. There is an urgent need for business and industry to identify with the strategy of a university they wish to partner. Only then will agreements of mutual benefit be achieved in a sustainable way.

8. Finally we agree strongly with sentiments expressed in two contributions to the Secretary of State's Higher Education Debate by two very prominent business leaders on the role of universities:

— ". . . the overarching purpose of a university is to teach students to be excited by ideas, and to develop the skills of observation and critical thinking to enable them to develop new skills, fresh knowledge and sound judgement throughout their lives, by themselves and for their own sakes" (Marjorie Scardino, CE, Pearson plc)

— ". . . universities have a distinct and different role from companies and it would not be good value to turn them into corporate look-alikes" (Sir John Chisholm, Chair Qinetiq Group plc, Chair MRC).

April 2009

Memorandum 79

Supplementary submission from the Royal Academy of Engineering

1.1 The Royal Academy of Engineering, along with six of the major engineering institutions, submitted a memorandum to the main call for evidence from the Committee. This response to the Committee's supplementary call for evidence is based on work that we have subsequently carried out in partnership with the Royal Society and the British Academy, precipitated by Lord Drayson's speech to the Foundation for Science and Technology on 4 February and has been prepared by the Royal Academy of Engineering with the endorsement of the same engineering institutions and organisations, a full list of which is included on the title page.

1.2 A speech by Rt Hon John Denham, MP, Secretary of State (DIUS), at the Royal Academy of Engineering on 19 February built on Lord Drayson's speech by catalysing a debate about the balance of investment in science and innovation to favour those areas in which the UK has a clear competitive advantage. The Secretary of State also defined the nature of the debate as not whether a balance should be sought but how it should be achieved.

1.3 Ministers appear to wish to take advantage of a decade of investment in the science base by encouraging the commercialisation of the scientific ideas and concepts produced by it. All political speeches to date on the subject have stressed that this vision is about reaping the benefits of research already funded and that the commitment to curiosity-driven research funding remains unaffected.

1.4 We believe that there will always be serendipitous economic benefit from some blue sky research conducted primarily for the purpose of the pursuit of knowledge. However, the scale of the challenges we face as a society and economy calls for much closer alignment of research with clear objectives and better processes for creating products and services from ideas. In general, there is a funding gap from the point where research ideas move out of universities through to their becoming commercially-ready technologies that industry sees as sufficiently risk-free to take on. Translational research bridges the gap between pure research and applied research and much has been achieved to improve this transition, particularly in the biomedical fields. However, the bridge between applied research and commercially exploitable products and services remains weak.

1.5 One of the biggest obstacles to getting innovation moving "up the chain" is the way the stock exchange and investment community behave with small and medium size technology companies in the UK. In the USA, where small companies grow into big companies, this happens because of a more tolerant and supportive investment philosophy (coupled with easier flow of funds and Government support through schemes such as SBRI). This has never been the case in the UK and even the better Vice Chancellors are focused on relatively short-term investments with IPO or trade-sale. Similarly, investors—especially the institutional investors who effectively determine the fate of listed companies—have very little tolerance of market conditions or irrespective of whether a company is managing itself well and will put pressure on management very quickly or even push towards a trade-sale (and the disappearance of the growing technology company). This is very different to the USA experience for technology companies. These factors are probably a bigger issue than the university technology transfer gap which, in recent years, has improved greatly with the help of funds such as HEIF and the TSB schemes.

1.6 While our comments make generic points it is also important to note that innovation models can differ between engineering sectors. If Government's overarching goal is to improve UK economic performance as part of an active industrial strategy, policy needs to be flexible enough to reflect these differences.

2. *What form should the debate or consultation about the question take and who should lead it?*

2.1 In the area of pre-commercial technologies, there are two forces at work. Researchers in universities are keen to push their technologies out of the lab and into the commercial world where they can become or contribute to commercial products. At the same time, commercial companies are looking for emergent technologies to fulfil particular needs. It is an area where solutions looking for problems and problems looking for solutions could be better managed to converge productively.

2.2 Government policy needs to be made with a much broader understanding of how industry makes its investment decisions. There would be significant value in the establishment of an office of technology assessment, drawing on the expertise in Government departments, the TSB and other bodies and industry to promote understanding of and provide advice and support for the productivity of UK based research and development activity. It would be important that this function were at the core of the responsible department so that its expertise is fully embedded in the policy-making process.

2.3 Industry, by and large, is well focused on the technologies it needs and wants to pull through. Universities, however, are less focused on the potential commercial uses of their discoveries. It therefore follows that the debate should be led and fully informed by the industries and business sectors which seek to make use of and commercialise the fruits of academic research.

3. *Whether such a policy is desirable or necessary*

3.1 The UK has often been justifiably characterised as being good at creating scientific ideas and concepts from pure scientific research, but poor at converting those ideas into commercially valuable products and services. This view is often illustrated by reference to MRI scanners where the initial "discovery" was British, but development of the product was done in the USA. There are many such examples.

3.2 Historically, these fruits of academic research were developed into products by large corporate labs such as those that were owned and operated by companies such as IBM, Xerox and General Electric. In the UK, these large corporate labs are now very few and far between and the mechanism for de-risking development has shifted towards many high-tech university spin-out companies funded by venture capital to the point where they become an attractive acquisition target for large corporations.

3.3 In the absence of large corporate labs, support for this stage of the innovation process—taking ideas from the pre-commercial research stage through to fully demonstrated products and services—is essential to reaping the benefits of already-funded research. It therefore follows that such a policy is both desirable and necessary if the UK is to improve innovation performance.

4. *What are the potential implications of such a policy for UK science and engineering, higher education, industry and the economy as a whole?*

4.1 Any improvement in the rate at which ideas created by UK publicly-funded research can be converted into wealth-creating products and services will directly benefit industry and the economy, and indirectly benefit the UK Exchequer in terms of additional tax receipts.

4.2 Engineering research is usually at the more applied end of the research spectrum, closer to the development of commercial products and services than is fundamental science research. Interaction between industry and engineering researchers as part of the process of developing scientific ideas is likely to increase the stream of industrial sponsorship for directed research.

4.3 Curiosity-led research has been, and continues to be, the engine behind the creation of ideas suitable for development into wealth-creating products and services. Research Council spending on fundamental scientific research must be preserved if any policy to improve the conversion of scientific curiosity into wealth creation is to be sustainable.

4.4 There will always be serendipitous economic benefit from some blue sky research conducted primarily for the purpose of the pursuit of knowledge. However, the scale of the challenges we face as a society and economy call for much closer alignment of research with clear objectives and better processes for creating products and services from ideas. While curiosity-led research is undoubtedly the engine behind the creation of scientific ideas, unless the whole pipeline from fundamental research to commercial products and services is considered, the benefits of any policy to direct academic research for the economic benefit of UK plc will likely be lost.

4.5 In general, there is a funding gap from the point where research ideas move out of universities through to their becoming commercially ready technologies that industry sees as sufficiently risk free to take on. Translational research bridges the gap between pure research and applied research and much has been achieved, particularly in the biomedical fields, to improve this transition. However, the bridge between applied research and commercially exploitable products and services is still weak.

4.6 Additional funding for development in this area, between academic inquiry and commercial readiness, is likely to produce economic benefit more quickly than at any other stage in addition to ensuring that some ideas make it through this funding "valley of death" that might otherwise falter.

4.7 This is an area where the Technology Strategy Board is active but is limited by the funding available to it. The spread of technology areas that the TSB works across potentially leads to its funding being spread too thinly to have real impact in certain key areas. In order to protect or even build on the value of investment by the Research Councils, the TSB's budget should arguably be of the same order of magnitude as the Research Councils' as a whole.

5. *Conclusions*

5.1 The speed and effectiveness with which scientific advances can be transformed into wealth creating products and services can and must be radically improved. The raw material for this innovation process, the scientific research, is available and ripe for commercialisation. Only the current limitation of the innovation process and risk that companies need to overcome stand in the way of UK plc reaping the full benefit of a decade of investment in the science base. Government action to help and encourage this faster and more efficient transfer of knowledge and innovation should now be prioritised to give the UK the technological base to engineer its way out of recession.

April 2009

Memorandum 80

Supplementary submission from The Royal Society

Britain has a great tradition in science, research and engineering. We must continue to build on this. We cannot predict the 21st century counterparts of quantum theory, the double helix or the computer, or where the great thinkers, innovators and entrepreneurs of the future will get their formative training and inspiration. But one thing seems certain: unless we as a nation continue to get smarter, we will get poorer. The UK's relative standing will fall unless more technologies and innovations originate and are exploited here in the UK.

We don't always know where the benefits of research will come from, or how long it will take for them to manifest. Even in medicine, where research is often highly-targeted, the lag between scientific research and health benefit can be anywhere from 10–25 years. [220] In other areas of science, it can be decades before direct benefits are realised.[221]

To maximise the breadth and depth of our scientific potential, we therefore need to support research capacity across the full range of disciplines. We must balance the need to invest in world-class individuals,[222] with the need to invest in world-class research infrastructure and established centres of excellence. We must also ensure that the UK continues to attract and retain the best researchers from around the world to support value-added partnerships.

In the clusters that our best universities have built around them, talent attracts talent (and big and small companies too). There is a symbiosis between applied and pure science—or as former Royal Society President, George Porter, averred, that there were two kinds of science: applied and not yet applied.

The scale of the challenges we face as a society and economy call for closer alignment of research with objectives and better processes for creating products and services from ideas. In general, there is a funding gap from the point where research ideas move out of universities through to their becoming commercially ready technologies that industry sees as sufficiently risk free to take on. Translational research bridges the gap between pure research and applied research and much has been achieved, particularly in the biomedical fields, to improve this transition. However, the bridge between applied research and commercially exploitable products and services is still weak.

A prerequisite for potential investors in all sectors is clarity, stability and certainty to allow a proper assessment of risk and potential return on investment. Government must set a clear, well-communicated policy and regulatory framework that promotes investment. There should be a cross-departmental focus on identifying and addressing barriers and perceptions that could deter investment, especially in new and emerging markets. Government procurement has an important role to play in speeding the adoption of new technological solutions. The tendency is for Government and public sector procurement to specify lowest-cost solutions; however, there is an opportunity for public expenditure to be used to stimulate innovation research and innovation, increase the flow of opportunity for leading-edge SMEs, and help promote emerging technologies.

It is essential that innovation is understood broadly, in line with last year's *Innovation Nation* White Paper, which stressed the importance of taking a holistic view of innovation, and highlighted how the UK excels at "hidden innovation" in its leading services sectors and creative industries. The UK will have to compete

[220] *Medical Research: What's it worth? Estimating the economic benefits from medical research in the UK*, report for the Wellcome Trust, the Medical Research Council and the Academy of Medical Sciences, November 2008.
[221] Ben R Martin and Puay Tang, *The benefits from publicly funded research*, SPRU working paper 161, June 2007.
[222] K Pavitt, *What makes basic research economically useful?* Research Policy 20 (1991), pp 109–119.

by developing new products and services, discovering new ways of doing business, encouraging innovation in its public sector and public services, and drawing more effectively on the whole of the research base: natural sciences, engineering, the humanities and social sciences.

The Royal Society believes is it desirable to focus investment on specific sectors or technologies relevant to major challenges we face In the UK and globally. Indeed we believe that, for example, the needs of a low-carbon economy are worth of such targeted investment—areas such as plastics electronics, high performance batteries, green chemistry etc. However, we would be concerned if the balance within the ring-fenced science budget were to shift away from the responsive mode of funding the most excellent research from across all areas. In assessing our position on these subjects, we have considered implemented policies rather than the content of Ministerial speeches.

April 2009

Memorandum 81

Submission from the Open University (OU)

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

Thank you for the opportunity to comment on issues raised by the Select Committee, referring to Lord Drayson's question: "Has the time come for the UK—as part of a clear economic strategy—to make choices about the balance of investment in science and innovation to favour those areas in which the UK has clear competitive advantage?"

What form a debate or consultation about the question should take and who should lead it

Such a debate should be led by a body which has no vested interests in the issue and which has democratic accountability, such as a Parliamentary Committee, rather than by government-appointed advisors.

To be truly a debate rather than a facade or fait accompli, an inquiry should investigate key policy assumptions underlying Lord Drayson's semi-rhetorical question. In particular:

- Clear? His question assumes that a competitive advantage is (or can be) clear. If it is really so clear, then do UK companies already pursue this opportunity by investing significantly in the specific technique or sector? What doubts are indicated about an advantage? Given the long history of failed expectations for several technologies, what counts as evidence of future commercial prospects?
- UK advantage? His question assumes that the unit of competitive advantage is an entire nation, as if we were all common shareholders and potential beneficiaries of any return on investment. This assumption might be plausible if all investment remains within a public-sector body, but is this arrangement being proposed? How is the UK being conflated with specific private interests?
- Science/innovation: His question also assumes that more science can make a significant difference to innovation and its economic competitiveness. As Lord Drayson put it in his speech, we should "boost the economic impact of our science base". This presumes many close linkages between more science, innovation and commerce. Yet these links have a long history of disappointment and failure, especially when starting from science. Meanwhile resources have been diverted from alternative innovation pathways, which need not depend on new scientific knowledge.

Whether such a policy is desirable or necessary

Such a policy may be desirable if key policy assumptions (as above) are properly investigated, by drawing on diverse views from experts and stakeholders, as a basis for scrutinising specific proposals for investment priorities in scientific research. Such proposals generally combine arguments about competitive advantage and common societal benefits, thus assuming (or implying) that these are complementary. Many such proposals also assume that societal problems result from genetic deficiencies, as the basis for a techno-fix. All these policy assumptions should be investigated, putting a strong burden of evidence upon the advocates.

For example, speaking at the Royal Society on 4th February, Lord Drayson's speech linked general societal problems—ageing populations, ill health, obesity, etc—to NHS resources, to genomics, to "the genetic basis of disease" as a general assumption about its cause. From this tendentious conflation, he has advocated private-sector access to the NHS database, in the name of the public good. Whose problem is being addressed by this solution?

As another recent example, the BBSRC Chief Executive Professor Douglas Kell has requested an extra £100 million for crop research to increase yields in ways not requiring oil-based inputs, in order to avoid world hunger and food riots. "Only science can bring the levels of increased production we need to ensure safe, nutritious and affordable food for everyone", he said.

http://www.bbsrc.ac.uk/media/releases/2009/090428_increased_funding_food_security.html

http://news.bbc.co.uk/today/hi/today/newsid_8021000/8021960.stm

Such claims make several policy assumptions:

- that the growing appropriation of land for global markets (mainly in animal feed and biofuels) must be accepted as a natural feature of trade liberalisation;
- that world hunger is due mainly to inadequate agricultural production rather than other causes, eg small-scale producers losing income and access to land for local food need;
- that yields are limited by currently available crops due to deficiencies which could be corrected through laboratory research; and
- that novel crops could significantly increase yields without increasing inputs such as water, fertiliser and chemicals.

Such assumptions have been questioned by numerous studies. Alternative perspectives have been presented in the prestigious 2008 report of the International Assessment of Agricultural Knowledge, Science and Technology for Development (IAASTD). All the above assumptions warrant close scrutiny by drawing on diverse views from experts and stakeholders, especially NGOs dealing with development issues.

What the potential implications of such a policy are for UK science and engineering, higher education, industry and the economy as a whole

If public-sector investment decisions simply accept the above assumptions, then the decision-making procedures would lack democratic legitimacy. If public investment is directed at techno-fixes (such as the ones above), then resources may be diverted from understanding the wider causes of societal problems and from addressing them, while benefiting only private interests (at most).

If an inquiry systematically questions the above assumptions, then the outcome could be quite different priorities than those being currently advocated. Private interests could complement the public good rather than subordinate it.

Were such a policy pursued, which research sectors are most likely to benefit and which are most likely to lose

Benefit or loss may result, but not necessarily for an entire sector of research or industry. A targeted investment may favour specific techniques within a research sector, thus pushing the sector along one pathway, while losing or weakening other potential pathways. At issue is what counts as scientific and societal progress; such a policy judgement should be democratically accountable.

Note on my relevant expertise

For two decades I have carried out research on the regulation and innovation of agricultural biotechnology, in projects funded by the European Commission and by the ESRC. Now I am carrying out an EC-funded study of the Knowledge-Based Bio-Economy in the agricultural sector (see www.crepeweb.net). In the next few months we will have findings relevant to your inquiry. I would be pleased to send you or to present more information along those lines.

May 2009

Memorandum 82

Letter from Rt Hon John Denham MP, Secretary of State for Innovation, Universities and Skills

Thank you for your letter of 30 March on UK science policy.

Government investment through the Science and Research Budget has more than doubled in real terms from £1.3 billion in 1997–98 to £3.6 billion in 2008–09. Government support for the UK's research base is at its highest ever level and will enable the UK to maintain its leading position in research excellence, whilst stronger exploitation of research will help to build a stronger economy.

Against this background, recent speeches by the Prime Minister, Lord Drayson and I have looked at how the research base can help the future UK economy. Lord Drayson wrote to the Research Councils, Funding Councils and National Academies, seeking their views on how the country can get the greatest benefits from the Government's sustained investment in research.

In response, the Research Councils, HEFCE and the TSB held a conference on 6 April, where I understand that they discussed a range of proposals with a wide audience. The results were published and have been sent to Lord Drayson (http://www.rcuk.ac.uk/research/future.htm). In the Budget, £106 million of savings were identified, which will be reinvested within the Science and Research Budget to support key areas of economic potential.

This has been an extremely valuable exercise, setting out the future direction without threatening fundamental curiosity-driven research. I look forward to seeing Research Council priorities as they are developed further.

This is not the end of the issue—Lord Drayson and I would like the community to remain alert to further opportunities. Indeed Lord Drayson recently met universities and business from the CBI membership where they discussed research priorities.

The Government remains committed to funding a broad base of fundamental and applied research. Alongside this, Lord Drayson and would like to see the community maintain the debate about research priorities, so that it becomes part of the culture of a healthy UK research base.

May 2009

Memorandum 83

Submission from the UK Drug Policy Commission (UKDPC)

"Putting Science and Engineering at the Heart of Government Policy"

1. This memorandum provides a brief description of the use of scientific evidence within drug policy and makes some recommendations on how this can be improved. The brevity is intended to assist easy assimilation into the Committee's final evidence session and where applicable references have been provided for further detail.

2. The UK Drug Policy Commission (UKDPC) is an independent charitable body that uses evidence to scrutinise current UK drug policies and to influence policy decision-making. Chaired by Dame Ruth Runciman, it includes experts like Professor Colin Blakemore, Professor Ilora Finlay and Professor Alan Maynard. A full list of Commissioners is appended.[223] The Commission is particularly concerned about the use of scientific evidence in the formulation of drug policy, and reconciling science in this area with politics and public opinion. It has highlighted a number of concerns which are relevant to your inquiry:[224]

2.1 Investment in research and evaluation is extremely low, despite the high costs involved. The UK drug strategy identifies close to £1 billion of direct Government expenditure and a further £1 billion of related spend.[225] The total economic and social costs of Class A drug use in England and Wales are an estimated £15 billion.[226] Yet we estimate (from inadequate available data) that annual spend on research to date is less than 1% of total direct public expenditure on the drug strategy. For comparison, within the federal US treatment and prevention budgets, research accounts for 18% and 27% of spend respectively.[227]

2.2 There is poor coordination of current research, evaluation and knowledge transfer exacerbated by the complex cross-discipline, cross-department and part-devolved nature of drug policy. There is no single body responsible for knowledge building and transfer in this area, although in last year's (2008) UK drug strategy the Home Office promised to develop "a cross-government research plan, aligned to the developing international evidence base".[228]

2.3 There has never been an official independent evaluation of UK drug strategies and their impact, which is likely to have hampered real progress to optimise their effectiveness.

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[223] For more information on the UKDPC, visit www.ukdpc.org.uk

[224] UK Drug Policy Commission, *A Response to Drugs: Our Community, Your Say* Consultation Paper, UKDPC 2007. http://www.ukdpc.org.uk/resources/Drug_Strategy_Consultation_Response.pdf. See also: UK Drug Policy Commission, *The UK Drug Classification System: issues and challenges*, UKDPC 2008. http://www.ukdpc.org.uk/resources/ACMD_Ecstasy_Submission_September_2008.pdf

[225] HM Government, *Drugs: protecting families and communities*, COI, 2008. http://drugs.homeoffice.gov.uk/publication-search/drug-strategy/drug-strategy-2008

[226] Christine Godfrey *et al*, *The Economic and Social Costs of Class A drug Use in England and Wales*, 2000, Home Office Research Study 249, 2002. http://www.homeoffice.gov.uk/rds/pdfs2/hors249.pdf

[227] See http://www.whitehousedrugpolicy.gov/publications/policy/09budget/tbl_3.pdf. This not only provides an international example of appropriate resource allocation for research, but also an example of transparency as research spend is clearly separated within "Treatment" and "Prevention" budgets. However, it is disappointing that research does not appear in the "Supply Reduction" budget breakdown. This area attracts by far the most spend and suffers most from the poverty of evidence.

[228] HM Government, *Drugs: protecting families and communities, Action Plan 2008–11*, COI 2008. See: http://drugs.homeoffice.gov.uk/publication-search/drug-strategy/drug-action-plan-2008-2011

2.4 It is therefore unsurprising that there are enduring gaps in our knowledge about "what works" and why across many strands of the drug strategy which should be of serious concern for any Government seeking evidence-based policies. The Commission has identified 10 key gaps in the evidence for the 2008 UK Drug Strategy and noted that many of these correspond with those identified a decade earlier.[229] The Academy of Medical Sciences has also highlighted "the many unanswered scientific and clinical questions that remain" in the area of neuroscience and addiction.[230]

2.5 Drug policy has become increasingly politicised. Issues related to illegal drugs attract significant media interest, public concern and moral judgement and the Commission has observed the increased politicisation of drug policy in recent years. This has put a strain on the relationship between scientific advice and the formulation of government policy. This has been particularly evident during recent debates on the legal classification of drugs (particularly cannabis and ecstasy).

3. The Advisory Council on the Misuse of Drugs (ACMD) is an expert, independent group provided for by the Misuse of Drugs Act (MDA) 1971 to "keep under review the situation in the United Kingdom with respect to drugs" and to advise ministers accordingly. Whilst it is best known for its role in advising on the legal status of drugs, its remit under the MDA extends to advising on a wide range of measures:

- for restricting the availability of drugs;
- for enabling people affected by drug misuse to obtain proper advice, treatment rehabilitation and aftercare services;
- for promoting cooperation between the relevant services;
- for educating the public about the dangers of drug misuse; and
- for promoting research and information about dealing with problems associated with drug misuse.[231]

4. The role of the ACMD was, of course, subjected to detailed parliamentary scrutiny by the House of Commons Science and Technology Committee in 2006.[232] Since then, the Advisory Council has undergone some important changes, including moving the secretariat to the Scientific Branch of Home Office and holding meetings which are open to the public. However, a number of issues remain concerning the role of the ACMD which are relevant to this paper:

4.1 The ACMD's work is constrained by available resources and the Advisory Council has "cut its cloth" accordingly. The Advisory Council has produced high quality, influential reports aimed at improving public policy. Most recently these included *Hidden Harm* in 2003, *Pathways to Problems* in 2006 and *The Primary Prevention of Hepatitis C among Injecting Drug Users* in 2009.[233] However, some areas of policy, particularly in the area of restricting drug supply and the criminal justice system, have not received attention for over a decade.[234] Yet it is these areas that account for over half of total resources spent and perhaps suffer most from the poverty of available evidence. Furthermore, resources seriously limit the amount of research the Advisory Council is able to commission. Increasing the resources and capacity of the ACMD would undoubtedly allow it to develop a more comprehensive approach.

4.2 The Government's rejection of ACMD advice on two counts in relation to drug classifications (cannabis and ecstasy) in the last 12 months has led many to question the current standing of scientific advice in the formulation of drug policy. The Commission has called for a review of the ACMD's role in drug classification decisions, which should examine options which might take decisions about where a drug should be ranked based on its harms away from direct ministerial influence.[235]

4.3 The Academy of Medical Sciences has recommended that the ACMD should increasingly engage with the general public in order to reconcile scientific evidence and drug policies with public opinion.[236] Whilst the Advisory Council commissioned a public opinion poll to inform their cannabis classification review, and now have open meetings, there appears to be little in the way on ongoing informed dialogue with members of the public.

5. We conclude:

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[229] UK Drug Policy Commission, *A Response to Drugs: Our Community, Your Say* Consultation Paper, UKDPC 2007. http://www.ukdpc.org.uk/resources/Drug_Strategy_Consultation_Response.pdf

[230] The Academy of Medical Sciences, *Brain science, addiction and drugs*, AMS 2008. See: http://www.acmedsci.ac.uk/p99puid126.html

[231] See the Misuse of Drugs Act 1971: http://www.statutelaw.gov.uk/content.aspx?LegType=All+Legislation&title=The+Misuse+of+Drugs+Act+1971&searchEnacted=0&extentMatchOnly=0&confersPower=0&blanketAmendment=0&sortAlpha=0&TYPE=QS&PageNumber=1&NavFrom=0&parentActiveTextDocId=1367412&ActiveTextDocId=1367415&filesize=5871

[232] House of Commons Science and Technology Committee, *Drug Classification: Making a Hash of It?*, fifth report from session 2005–06, TSO, 2006. http://www.publications.parliament.uk/pa/cm200506/cmselect/cmsctech/1031/1031.pdf

[233] All available at: http://drugs.homeoffice.gov.uk/drugs-laws/acmd/reports-research/

[234] The ACMD's last report to focus on this area was in 1996: *Drug Misusers and the Criminal Justice System Part III: Drug Misusers and the Prison System: An Integrated Approach* (no longer in print).

[235] UK Drug Policy Commission, *The UK Drug Classification System: issues and challenges*, UKDPC 2008. http://www.ukdpc.org.uk/resources/ACMD_Ecstasy_Submission_September_2008.pdf

[236] The Academy of Medical Sciences, *Brain science, addiction and drugs*, AMS 2008. See: http://www.acmedsci.ac.uk/p99puid126.html

5.1 There is a strong case for a substantive increase in the proportion of investment in research and evaluation. This is even more important in a climate of shrinking or frozen budgets as the only way to improve outcomes is to optimise public expenditure. Maximising value for money and effectiveness must now be a priority, and this requires detailed scrutiny of policies and their implementation.

5.2 New systems should be adopted for the coordination and delivery of research and evaluation, and to promote use of the findings. The Medical Research Council together with the Economic and Social Research Council have recently introduced a "research clusters" initiative which is to be welcomed[237] but we have yet to see the overarching research plan that was promised in the UK drug strategy. A single point of leadership might be required. Given the ACMD's independent status and its remit which already extends to advising on measures for promoting research and information, one option is to resource the Advisory Council to fully adopt this responsibility. We note that a National Drugs Evidence Group has recently been established as a project group of the Scottish Advisory Committee on Drug Misuse (SACDM—soon to be reconstituted as the Drugs Strategy Delivery Commission, see below) to advise on research priorities and coordinate research and evaluation efforts.

5.3 There should be an independent evaluation of the UK Drug Strategy which considers its impact, including any unintended consequences and cost effectiveness. Details of an independent evaluation of the Scottish drugs strategy are expected to be announced shortly, and the UK strategy should be subjected to similar independent scrutiny.

5.4 There should be a stronger emphasis on sustained deliberative engagement with the public to help reconcile policy, evidence and public opinion. This would allow the Government to reference informed public opinion in complex areas where science may seem to run counter to popular opinion.

5.5 Options for placing the Advisory Council on a stronger footing, with enhanced resources and capacity, should be considered. It may also be appropriate to provide the Advisory Council with some executive powers so that some policy decisions can be made within an objective and scientific environment outside of direct control of Government ministers. The Scottish Government has just announced a new expert "Drugs Strategy Delivery Commission" to replace the Scottish Advisory Committee on Drug Misuse, which will oversee the implementation of the national drugs strategy.[238] It will operate at arms-length from Government with an independent chair, unlike the Scottish Advisory Committee on Drugs Misuse which is chaired by the Scottish minister for Community Safety. There are also international models worthy of consideration, including the Canadian Centre on Substance Abuse which has "a legislated mandate to provide national leadership and evidence-informed analysis and advice",[239] the Special Research Centres funded by the Australian Research Council[240] and the Addiction Technology Transfer Center in the US.[241]

The UK Drug Policy Commission would certainly welcome any measures that improve the footing of scientific advice in the formulation of drug policy and therefore eagerly awaits the outcome of the Committee's inquiry.

May 2009

Annex

List of UKDPC Commissioners

Dame Ruth Runciman (Chair).

- Chair of the Central and North West London NHS Foundation Trust; and
- Deputy Chair of the Prison Reform Trust.

Professor Baroness Haleh Afshar OBE

- Professor of Politics and Women's Studies at the University of York.

Professor Colin Blakemore FRS

- Professor of Neuroscience at the Universities of Oxford and Warwick; and
- Chair of the Food Standard Agency's General Advisory Committee on Science.

[237] See http://www.mrc.ac.uk/Fundingopportunities/Calls/Addictionresearch/Addictionresearchclusters/index.htm
[238] See: http://www.scotland.gov.uk/News/Releases/2009/04/20130938
[239] See: http://www.ccsa.ca/Eng/AboutUs/Pages/default.aspx
[240] See: http://www.arc.gov.au/ncgp/src/src.htm
[241] See: http://www.attcnetwork.org/index.asp

David Blakey CBE QPM

— Former President of the Association of Chief Police Officers and Chief Constable of West Mercia.

Annette Dale-Perera

— Director of Quality at the National Treatment Agency (NTA).

Daniel Finkelstein OBE

— Comment Editor and a weekly columnist of *The Times*.

Baroness Finlay of Llandaff

— Consultant in palliative medicine and honorary professor of Cardiff University's School of Medicine.

Jeremy Hardie CBE

— Research Associate of The Centre for Philosophy of Natural and Social Science at the London School of Economics, Treasurer of the Institute for Public Policy Research and a trustee of Somerset House and International House.

Professor Alan Maynard OBE

— Professor of Health Economics at the University of York.

Adam Sampson

— Chief Executive of Shelter.

Professor John Strang

— Director of the National Addiction Centre, Institute of Psychiatry, King's College London.

John Varley (Honorary President)

— Group Chief Executive of Barclays Bank Plc; and

— Chair of Business Action on Homelessness and President of the Employers' Forum on Disability.

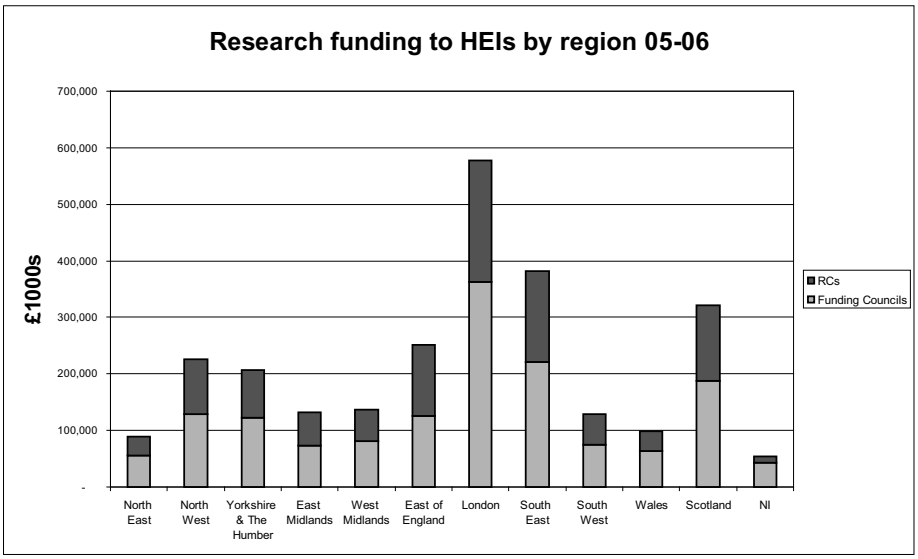
Memorandum 84

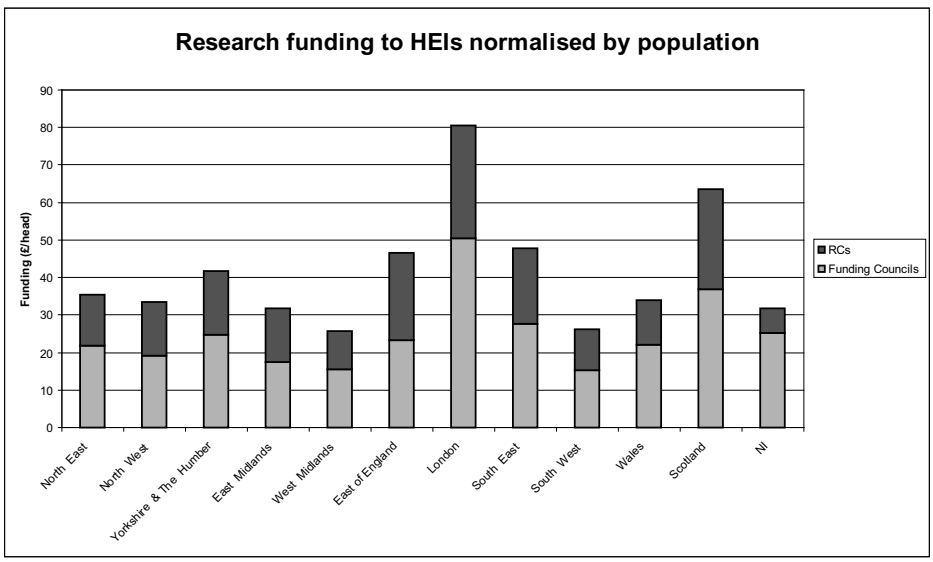
Supplementary evidence from the Department for Innovation, Universities and Skills following the oral evidence session on 16 March 2009

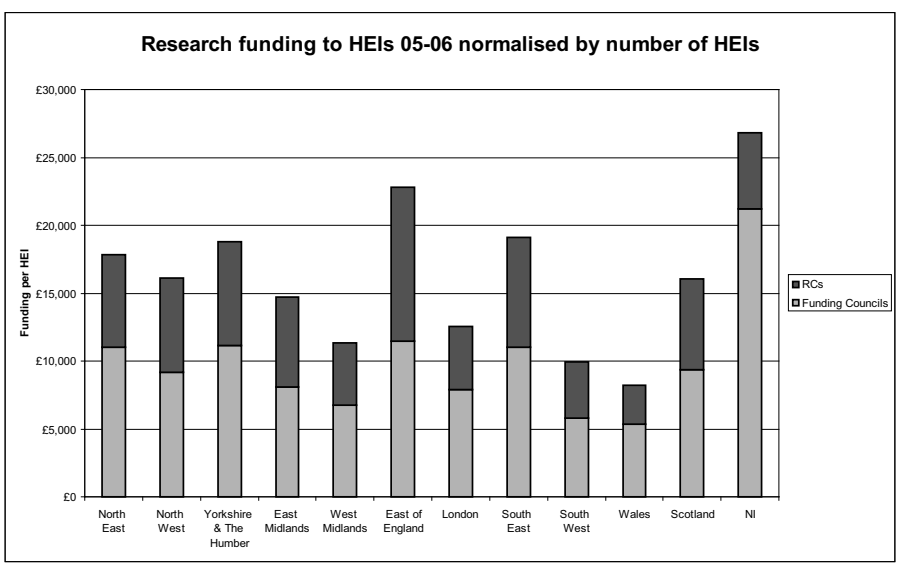
Following the oral evidence given by Adrian Smith on 16 March, the Committee asked for more detailed information on the geographical distribution of research funding. The first part of this note covers the information that Prof. Smith referred to in his evidence, namely research funding to Universities, with and without population normalisation. These data are taken from the HESA publication Resources of Higher Education Institutions for 2005–06 (for funding levels), the UCAS website (for HEI locations) and the 2001 Census (for population figures).

The most important point is that the allocation of research funding is made in relation to excellence, and geographical location is not taken into account Therefore, whatever variation there may be between the regions is fundamentally due to the quality of research in each region, as assessed by the community via peer review.

Nevertheless, it is interesting to note that substantial amounts of funding are won by HEIs in each region, and that the variation between regions is somewhat reduced if the data are normalised by population. London does receive noticeably higher funding levels, but this is perhaps unsurprising, since it has more than twice as many HEIs as any other region.


Research funding to HEIs by region 05-06
£1000s
700,000
600,000
500,000
400,000
300,000
200,000
100,000
-
North East
North West
Yorkshire & The Humber
East Midlands
West Midlands
East of England
London
South East
South West
Wales
Scotland
NI
RCs
Funding Councils


Research funding to HEIs normalised by population
Funding (£/head)
90
80
70
60
50
40
30
20
10
0
North East
North West
Yorkshire & The Humber
East Midlands
West Midlands
East of England
London
South East
South West
Wales
Scotland
NI
RCs
Funding Councils

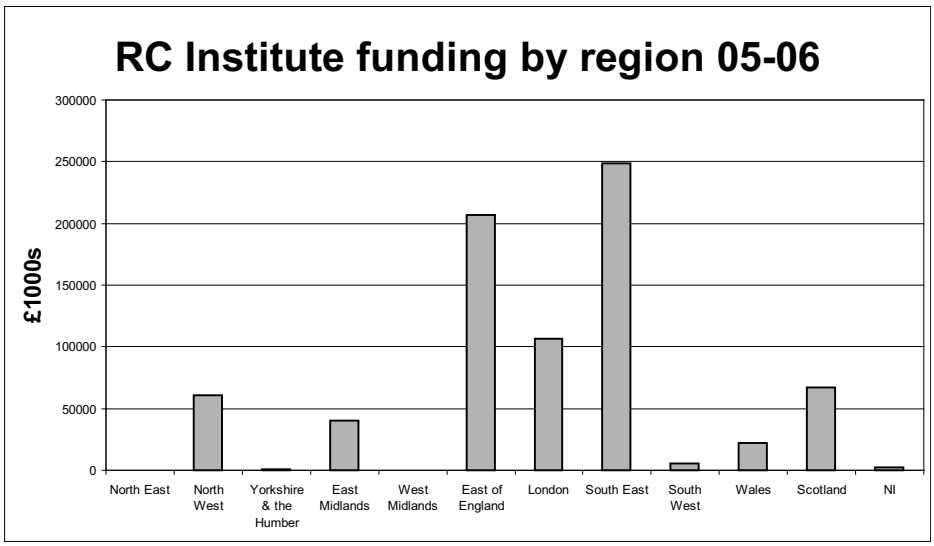

Research funding to HEIs 05-06 normalised by number of HEIs
Funding per HEI
£30,000
£25,000
£20,000
£15,000
£10,000
£5,000
£0
North East
North West
Yorkshire & The Humber
East Midlands
West Midlands
East of England
London
South East
South West
Wales
Scotland
NI
RCs
Funding Councils

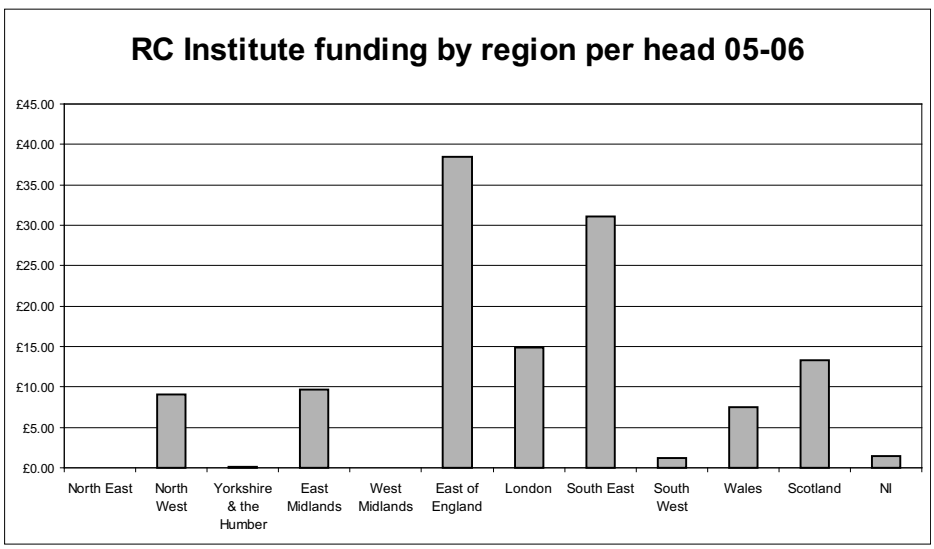
	North East	*North West*	*Yorkshire & The Humber*	*East Midlands*	*West Midlands*	*East of England*	*London*	*South East*	*South West*	*Wales*	*Scotland*	*NI*
Research funding to HEIs (£1,000s, 2005–06)												
Funding Council Recurrent grants (Research)	54,978	128,283	122,273	72,919	81,276	126,082	361,934	220,419	75,059	63,877	187,050	42,476
OSI Research Councils	34,131	97,721	84,593	59,711	54,795	124,866	215,863	161,909	54,410	34,604	134,298	11,147
Total	89,109	226,004	206,866	132,630	136,071	250,948	577,797	382,328	129,469	98,481	321,348	53,623
Population (2001 census)	2,515,479	6,729,800	4,964,838	4,172,179	5,267,337	5,388,154	7,172,036	8,000,550	4,928,458	2,903,085	5,062,011	1,685,267
Number of HEIs in region	5	14	11	9	12	11	46	20	13	12	20	2
Funding per head of population												
Funding Council	£21.86	£19.06	£24.63	£17.48	£15.43	£23.40	£50.46	£27.55	£15.23	£22.00	£36.95	£25.20
RCs	£13.57	£14.52	£17.04	£14.31	£10.40	£23.17	£30.10	£20.24	£11.04	£11.92	£26.53	£6.61
Total	£35.42	£33.58	£41.67	£31.79	£25.83	£46.57	£80.56	£47.79	£26.27	£33.92	£63.48	£31.82

The data in respect of Research Council (RC) Institute funding in 2005-06 have been specifically assembled by DIUS for the Committee's request. It has therefore not been formally audited, and should only be treated as indicative of the distribution of spend, rather than a definitive record. For the avoidance of doubt in what definition of a RC Institute has been used, a full list of Institutes included in these data is provided at Annex A. The location of Research Councils Institutes mainly reflects decisions taken several decades ago.

May 2009

	North East	*North West*	*Yorkshire & The Humber*	*East Midlands*	*West Midlands*	*East of England*	*London*	*South East*	*South West*	*Wales*	*Scotland*	*NI*
RC funding to Institutes (£1000s, 2005–06)												
BBSRC	0	0	0	0	0	99,499	0	39,458	0	18,906	13,539	0
MRC	0	0	0	10,316	0	60,535	106,511	22,158	2,120	0	25,647	0
NERC	142	12,262	649	29,883	170	46,989	180	23,155	3,628	2,882	15,426	2,446
STFC	0	48,520	0	0	0	0	0	163,860	0	0	12,580	0
Total	142	60,782	649	40,199	170	207,024	106,691	248,631	5,748	21,788	67,192	2,446
Population (2001 census)	2,515,479	6,729,800	4,964,838	4,172,179	5,267,337	5,388,154	7,172,036	8,000,550	4,928,458	2,903,085	5,062,011	1,685,267
RC Institute funding per head	£0.06	£9.03	£0.13	£9.63	£0.03	£38.42	£14.88	£31.08	£1.17	£7.51	£13.27	£1.45





Annex A

BBSRC:

Babraham Institute.
Institute of Food Research.
John Innes Centre.
Rothamsted Research.
Silsoe Research Institute.
Institute for Animal Health.
Institute of Grassland & Environmental Research.
Roslin Institute.

MRC:

MRC Anatomical Neuropharmacology Unit.
MRC Biostatistics Unit.
MRC Cancer Cell Unit.
MRC Cell Biology Unit.
MRC Centre for Protein Engineering.
MRC Clinical Sciences Centre.

MRC Clinical Trial Service Unit.
MRC Clinical Trials Unit.
MRC Cognition and Brain Sciences Unit.
MRC Collaborative Centre for Human Nutrition Research.
MRC Epidemiology Resource Centre.
MRC Epidemiology Unit.
MRC Functional Genomics Unit.
MRC Health Services Research Collaboration.
MRC Human Immunology Unit.
MRC Immunochemistry Unit.
MRC Institute of Hearing Research.
MRC International Nutrition Group.
MRC Laboratory of Molecular Biology.
MRC Mammalian Genetics Unit.
MRC Mitochondrial Biology Unit.
MRC Molecular Haematology Unit.
MRC National Institute for Medical Research.
MRC Prion Unit.
MRC Radiation And Genome Stability Unit.
MRC Toxicology Unit.
MRC Unit for Lifelong Health and Ageing.
MRC Protein Phosphorylation Unit.
MRC Human Genetics Unit.
MRC Human Reproductive Sciences Unit.
MRC Social & Public Health Sciences Unit.
MRC Virology Unit.

NERC:

British Antarctic Survey.
British Geological Survey.
Centre for Ecology and Hydrology.
Proudman Oceanographic Laboratory.
Research Ship Unit.

STFC:

Daresbury Laboratory.
Rutherford Appleton Laboratory.
Astronomy Technology Centre.

Memorandum 85

Submission from the Science Media Centre

PUTTING SCIENCE AND ENGINEERING AT THE HEART OF GOVERNMENT POLICY

Background

1. The Science Media Centre believes that scientists who are appointed to committees set up to advise Government should have access to independent media relations support.

2. At present however, even when the science advisory committees are entirely independent in practise and produce important pieces of independent scientific advice, they are almost entirely dependent on government press officers from the relevant department to manage the communication of that advice to the media (and hence to the public). This means that the norm is that government departments decide how, when

and who communicates the findings of independent advisory groups to the press. For obvious and understandable reasons political considerations often take priority over getting the evidence into the public domain and too often the scientific expertise and evidence get lost in the political melee.

3. The David Nutt incident which angered many in the scientific community was in my view an extreme example of a much more widespread problem. I believe this is a major issue in science communication. Many of the UK's best scientists sit on these one-off or standing advisory committees and the work they do in gathering scientific evidence and using the best scientific expertise to help inform advice to government is of critical importance to the country. The fact that too often this independent scientific advice does not get its day in the media spotlight means that the British public are losing out on expertise, science and evidence on some of the most controversial issues of our times.

4. There are many and varied examples of the negative consequences of the current system. The Science Media Centre has been closely involved in some of these examples but have anecdotal evidence of many more.

5. Even before the ecstasy and horse-riding story, our experience of the media support provided for the ACMD presents one useful example of the nature of the problem.

6. Because the Home Office press office decided on the timing of the media launch, that timing was linked to political considerations. In both the cannabis and ecstasy cases the Home Office decided that the media launch of the evidence and recommendations from the expert group would coincide with the official reaction to those recommendations by the Home Secretary. This immediately transformed the media story from one about scientific evidence likely to be covered by science reporters, into a political story about a row between advisors and ministers covered by home affairs and political reporters. Even if there had been no disagreement, merging these two distinct events had the effect of doing the following:

(a) the scientists were denied the opportunity to brief specialist science reporters and focus on communicating the substantial scientific evidence which had informed their recommendations; and

(b) The wider public and policy makers were also denied the opportunity to read the evidence as presented by the independent advisers, and so a key opportunity to inform this contentious debate with some scientific evidence was lost.

7. Because the press officers for the ACMD work for the Home Office press office there was an immediate conflict of interest when key recommendations of that independent committee conflicted with government policy. The press officers advising the Chair of the ACMD were effectively the Home Secretary's press officers.

Important caveat

8. Arguing that independent scientific advisors should have access to independent media relations advice is not the same as arguing that Government must always follow the advice of its scientific advisers. Politicians rightly base their decisions on many factors and have to measure independent scientific advice against the concerns of consumers, business, politicians, the police, and so on.

9. However to have fully informed debate in society it is critical that the public and policy advisers get access to all the information—and that must include the unadulterated scientific advice from experts invited to advise governments.

10. As someone who cares passionately about the quality of public debate on science, what worries me most is that society is losing out on the views and expertise of some of the UK's leading academics on some of the most important issues of our time.

11. Practical Proposals:

— We recommend that the default position should be that from the outset, newly established independent scientific advisory committees should be provided with access to independent media relations advice. This could be through an accredited list of well respected science press officers (either seconded from jobs in research institutions or free-lancers), or through expanding the role of the Science Media Centre to provide independent media advice to all scientific advisory committees.

— Many of these advisory groups are made up of scientists and a mixture of other experts including social scientists, economists, consumer groups, etc. One option would be to make sure that each committee actually has one media relations or communications expert as part of the group.

Conclusion

12. Nothing in the above is to undermine the work of government press officers, many of whom the SMC has successfully collaborated with for many years. Nor is it to suggest that the press officers working with scientific advisory groups should not work extremely closely with the press officers in the relevant government departments. However most science press officers we have liaised with in government would be the first to admit that there are problems with the current way of working.

May 2009

Memorandum 86

Supplementary submission from the Department for Innovation, Universities and Skills

Scientific Advice, Risk and Evidence Based Policy Making

The House of Commons Innovation, Universities, Science and Skills Committee has asked DIUS to provide a memorandum outlining progress made in implementing the recommendations of the former Science and Technology Committee's report *Scientific Advice, Risk and Evidence Based Policy Making* (HC900, Session 2005–06). This memorandum provides an update for the period since September 2007 (when the last update was provided).

The Government plans to publish a strategy for science in Government in the near future, which will set out in more detail its approach and plans, building on the approach set out in its reply to the S&T Committee's report.

The main areas of development since September 2007 are set out below.

Chief Scientific Advisers working together and with other analysts across Government

The Chief Scientific Adviser to HM Government (GCSA), Professor John Beddington, has established a "Core Issues Group" (CIG) of departmental CSAs (DCSAs) to address cross-cutting scientific issues such as climate change, food, water and energy; counter terrorism and infectious diseases. This group has formed sub-groups for specific tasks, for example to peer review the scientific content of the Gallagher report on biofuels.[242] It may shortly undertake work on the Severn Barrage. The GCSA has also worked closely with other analytical professions through the Heads of Analysis Group, for example to advise departmental Capability Review teams on analysis and use of evidence.

CIG meets regularly with Research Council Chief Executives, with whom it is developing a set of cross-cutting R&D priorities in preparation for the next Spending Review. CIG is also engaging with the Chief Executives of the leading Engineering Institutions to explore ways to improve the contribution that the engineering community can make to the government's response to major challenges such as climate change.

The GCSA also continues to provide personal advice to Cabinet Committees, the Prime Minister and Ministers more widely, for example on food, energy and security.

A Global Issues Team has been established within the Government Office for Science (GO-Science) to support the GCSA on policy issues where science and technology have an important role. These include climate change and energy, food security, nanotechnologies, bioscience, civil contingencies and counter terrorism.

Appointment of Chief Scientific Advisers

All the main science-using departments except HMT have either appointed CSAs or plan to do so.

Advice and support to departments

GO-Science continues to review departments' management and use of science with a view to improvement and spreading best practice. Reviews of the Home Office/Ministry of Justice and the Department for Health have been completed and the Food Standards Agency Review will be published shortly. Advice has also been provided to DFID on its management of science.

The Science Reviews are being replaced by a new "lighter touch" programme of "Science and Engineering Assurance Exercises" to provide faster and more focused oversight of Departmental management and use of science and engineering.

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[242] The Gallagher Review of the indirect effects of biofuels production, Renewable Fuels Agency, July 2008.

Foresight and Horizon Scanning

Foresight projects on Obesities, Mental Capital and Wellbeing and Sustainable Energy Management and the Built Environment have been completed. The Obesities project informed the Government strategy published in January 2008 (*Healthy Weight, Healthy Lives: a cross-government strategy for England*), and the other projects are also being followed up by relevant departments. In the wake of the Foresight report *Infectious Diseases: preparing for the future*, John Denham announced a major government investment in the development of diagnostic technologies on 7 October 2008.

The Horizon Scanning Centre has worked with departments across a wide range of issues, for example on International Futures scenarios (for DFID, MOD, BERR, FCO and HMT), on *UK Futures 2030* to inform DIUS's own strategy, and to help update the National Security Strategy. It has updated its horizon scans, and plans soon to publish a report on its engagement work on the wider implications of science and technology. It has helped establish a new Strategic Horizons Unit within the Cabinet Office, to address national security issues.

The Science and Engineering Profession in Government

Working with departmental Heads of Science and Engineering professions (HoSEPs), the GCSA is developing a long-term strategy that will set out a vision for the Government Science and Engineering community focusing on building a cohesive community, supporting scientists and engineers within the Civil Service and championing the profession across Government. This includes arranging periodic conferences, co-ordinating and promoting the spreading of good practice, drafting and maintaining the requirements of Professional Skills for Government as they apply to Government scientists and engineers, and exploring issues of importance to the profession and departments, such as development, recruitment and retention. The first ever national annual conference for the science and engineering profession in Government took place in January 2009; speakers included the Science and Innovation Minister, the Head of the Home Civil Service and the GCSA. Membership of the science and engineering community now stands at over 1600 civil servants from more than 30 government departments and agencies. During that conference the GCSA launched Government Science and Engineering (GSE) to promote the professional interests of scientists and engineers in government.

The Council for Science and Technology

The CST has provided further advice to the Prime Minister and Government orally and in writing. Its most recent major report addressed the relationship between academia and policy makers. John Denham will be leading the Government's response to that report.

The Cabinet Committee on Science and Innovation

The Cabinet Committee on Science and Innovation, ED(SI), is addressing the management and use of science by Government amongst other things, and the chair (Lord Drayson) will report quarterly to the Prime Minister. The GCSA advises at its meetings.

Other Areas

Other areas where progress has been made include:

— The revised Code of Practice for Scientific Advisory Committees (CoPSAC) was published in December 2007, based on public consultation, consultation with SACs and the S&T Committee's views. The Code has been well received by the SAC communities. SACs are also engaged with GO-Science in a programme of workshops to: build Secretariat networks; tailor the CoPSAC principles to address particular interests of Committee participants, chairs, and secretariats; train and induct Chairs with planned guidance to be issued later this year. Professor Beddington will host a networking reception for SAC Chairs, Secretariats, CSAs and officials on 24 February. The first annual monitoring of SACs reported to CSAC in December 2008; Professor Beddington will shortly write a note to the IUSS Committee summarising the findings.

— Induction material for CSAs and their officials has been revised and reissued.

— Guidance is being developed on risk communication for civil servants, addressing both policy makers in general and scientists and engineers in particular.

— The revised Government Code of Practice on Consultations[243] was published in July 2008.

— A revised UK strategy for science and society is being developed in the light of consultation in 2008.

— The Sciencewise Expert Resource Centre for Public Dialogue in Science and Technology has been launched. It has supported dialogue in areas such as drugs, hybrid and chimera embryos and stem cell research.

Further detail of the Government's approach and progress will be set out in the forthcoming science in Government strategy.

February 2009

Memorandum 87

Supplementary evidence from Professor John Beddington, Government Chief Scientific Adviser following the oral evidence session on Monday 18 May 2009

During the evidence session on the 18 May 2009, I was asked whether I could provide the IUSS Committee with correspondence between myself and the then Home Secretary, Jacqui Smith, on the classification of ecstasy and the advice provided on this issue by the Advisory Council on the Misuse of Drugs. I wrote to Jacqui seeking her agreement and the current Home Secretary has replied agreeing to the release of the letters subject to one condition, namely:

> "If the Committee wishes to place the letters in the public domain, I ask that it does so only as part of the final report to the *Putting science and engineering at the heart of government policy* inquiry, to ensure that the letters are referred to in the full and proper context of the Committee's findings."

I presume that you are content with this condition and attach the relevant letters.

June 2009

Letter dated 20 January 2009 from Professor John Beddington, Government Chief Scientific Adviser to the Rt Hon Jacqui Smith MP, Secretary of State for the Home Office

Ecstasy and the Advisory Council on the Misuse of Drugs

I read with interest the recent comments in the *Guardian* (Ian Sample's article of 5 January) attributed to the Home Office regarding the classification of ecstasy, linked to the forthcoming advice on this issue by the Advisory Council on the Misuse of Drugs. I am concerned that, if the comments are reported correctly, Ministers may be pre-empting their decision without having seen the forthcoming scientific advice on ecstasy.

Under the legislation, decisions on such matters do, of course, lie with Ministers, taking account of scientific advice on harms and other factors that may have a bearing. In providing evidence to the IUSS Committee in November I noted this position in relation to earlier decisions on cannabis.

However, an important principle, and one that underpins my own role and that of departmental Chief Scientific Advisors, is that policy decisions should be informed by robust scientific evidence.

Policy decisions on drugs will inevitably be difficult and contentious. There is a wider question as to whether the current approach to classification is the best one. For the longer term, I would welcome working with you, alongside Paul Wiles, to consider possible alternative approaches that better link the harm caused by drugs with the criminal justice system.

I hope this is helpful.

I am copying this letter to Sir Gus O'Donnell, Sir David Normington and Professor Paul Wiles.

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[243] http://www.berr.gov.uk/files/file47158.pdf

Letter dated 30 January 2009 from the Rt Hon Jacqui Smith MP, Secretary of State for the Home Office to Professor John Beddington, Government Chief Scientific Adviser

ECSTASY AND THE ADVISORY COUNCIL ON THE MISUSE OF DRUGS

Thank you for your letter of 20 January setting out your concerns about the Guardian article of 5 January. The article does accurately reflect the Government's position in that we currently have no intention to reclassify ecstasy and it is my view that it should remain at Class A.

You express concern that this view may pre-empt the advice of the ACMD on ecstasy which I will receive in early February. I do not consider that it is preempting the advice of the ACMD when I say that the Government believes that there is no safe dose of ecstasy, that it can and does kill unpredictably and, therefore, we have no intention of reclassifying the drug. I have not yet received the ACMD's advice nor the evidence upon which it is based so am unable to comment upon it.

I should emphasise that I value the advice of the ACMD and it helps to shape the Government drugs policy in a number of ways—classification being but one of those. With specific regard to classification, as you recognise, there are other considerations, which we need to carefully consider. The fact that I may disagree with a small number of their recommendations should not obscure the valuable work they do in a field which, I agree, is one where the decisions are often difficult.

You kindly offer to assist me in considering alternative approaches to linking the harms caused by drugs and the criminal justice system. Whilst I am not currently considering such a review, not least as I have recently commissioned a review of how the ACMD works, if, following the review, decide to look again at the classification system I will ensure my officials work closely with you.

I am copying this letter to Sir Gus O'Donnell, Sir David Normington, and Paul Wiles.

Letter dated 9 March 2009 from Professor John Beddington, Government Chief Scientific Adviser to the Rt Hon Jacqui Smith MP, Secretary of State for the Home Office

ECSTASY AND THE ACMD

Thank you for your letter of 30 January. Since then you have received the ACMD's advice on ecstasy and announced your decisions on classification. You have also criticised, in Parliament, Professor Nutt's article (not written in his ACMD capacity) in the Journal of Psychopharmacology comparing the harms of horse riding with those of taking ecstasy, and he has issued a statement apologising to those offended by the article.

This case illustrates the difficulties which can arise when scientific advice is given in an area of political sensitivity. I do not offer pat solutions, but would like to work with you and your officials in finding a better way forward to ensure that scientific evidence continues to contribute to debates even when such debates are politically sensitive.

There are two points I would like to make at this stage. First, the importance of creating and sustaining an environment in which the best brains of academe are willing and able to work effectively with Government to address the wide range of issues where science and research can point the way forward based on evidence. The Council for Science and Technology (CST), which I co-chair with Professor Dame Janet Finch, launched a report last week on how government and academia can work together, and I enclose a copy. John Denham has committed to working across Government to implement the report's findings. In that context there is a real risk that the events surrounding Professor Nutt's article, and some of the following sensationalist presentation in the media, will discourage scientists from working with Government. That would be unfortunate and damaging to Government.

In taking forward the CST report, I therefore think we, across government, need to develop some clear expectations. For example, that scientists who give of their time and expertise to assist policy-making, often without charge, are appropriately and publicly supported and valued by Government, by universities and by the research assessment process. This value may have implications for funding, but must also be reflected in esteem. In addition, scientists, especially those working in politically sensitive areas, should recognise the sensitivity of their position, without compromising their professional freedom to publish the results of their research and comment appropriately on it.

The second point, related to the first, is the handling of the review you are commissioning of how the ACMD works. Given the sensitivity of the ACMD in the process of science advice to Government, it is essential that it continues to follow the Code of Practice for Scientific Advisory Committees as a minimum. I would welcome the opportunity for my officials, who are responsible for the Code, to be involved in the review, and would be happy myself to discuss its recommendations with you before any decisions are taken.

I am copying this letter to John Denham, Gus O'Donnell, David Normington and Paul Wiles.

Letter dated 13 March 2009 from the Rt Hon Jacqui Smith MP, Secretary of State for the Home Office to Professor John Beddington, Government Chief Scientific Adviser

THE ADVISORY COUNCIL ON THE MISUSE OF DRUGS

Thank you for your letter of 9 March. The advice that the ACMD gives (both scientific and wider) is work that I value, demonstrated by the fact that I, and previous Home Secretaries, have accepted the vast majority of the Council's recommendations. I agree that the advice the ACMD provides can be in politically sensitive areas, which requires appropriate handling by all involved in the Council.

I am grateful for your offer to work with my officials and I know that you are already in close contact with Professor Paul Wiles and his team on the department's use of science and scientific advice. I will ensure that my officials involve you when I commission the ACMD process review and that the review refers to the Code of Practice for Scientific Advisory Committees in its Terms of Reference.

I am copying this letter to John Denham, Gus O'Donnell, David Normington, Mandie Campbell and Paul Wiles.

Printed in the United Kingdom by The Stationery Office Limited
7/2009 419983 19585