



Select Committee on Science and Technology

Corrected oral evidence: Government Chief Scientific Adviser

Tuesday 19 June 2018

3.25 pm

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Members present: Lord Patel (Chairman); Lord Borwick; Lord Fox; Lord Griffiths of Fforestfach; Lord Kakkar; Lord Mair; Lord Maxton; Baroness Neville-Jones; Lord Vallance of Tummel.

Evidence Session No. 1

Heard in Public

Questions 1 - 8

Witness

Dr Patrick Vallance, Government Chief Scientific Adviser.

USE OF THE TRANSCRIPT

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Examination of witness

Dr Patrick Vallance.

- Q1 **The Chairman:** Good afternoon, Dr Vallance, and thank you very much indeed for coming today to have a conversation with us. I know it is not long since you have taken over the post, and no doubt we will have other opportunities to have conversations with you, because we will always be interested to hear what the Chief Scientific Adviser is thinking about. I hope you will feel free, even informally, to comment on any of the inquiries that we do.

For the record, it would be helpful if you state your name so that we get it on record, and if you want to make a statement, please feel free to do so, otherwise we will go into some questions we have. I would prefer to treat this session as fairly informal, so feel free to comment on anything you like.

Dr Patrick Vallance: I am Patrick Vallance, the new Government Chief Scientific Adviser. I have been in post for just over two months. It is a great pleasure to be here. I would like to thank the Committee for the work that it has done in the past because I know how supportive it has been of previous GCSAs and how important the work of this Committee has been. I will not make any other comments but go straight into answering the questions that you have.

- Q2 **The Chairman:** As the new Chief Scientific Adviser, what do you think this role is and should be about? What are your immediate priorities that we might consider?

Dr Patrick Vallance: At its most reductionist I suppose, the role is to ensure that the Government, and specifically the Prime Minister and Cabinet, get the best possible scientific advice in order to be able to make evidence-based policy and decisions. That advice needs to be rigorous and evidence based. It needs to take both a short-term and long-term strategic view, and it needs to be fearless. In other words, it will not always be popular and will not always be in support of a position. It needs to be the scientific evidence of the day, including where that is imperfect and where there are gaps. That is the fundamental part of the job from which a lot else springs, of course.

On the question about priorities, I think of them in terms of internal and external priorities. There are three internal priorities—the things that I want to look at to make sure that this works well across government. They are to ensure that: the chief scientific advisers are in post; we have the right people in post; and we get the network of chief scientific advisers working really effectively. Given the diversity of interests that those individuals have and the strengths they bring, I view that network as particularly important to the joined-up advice for science across government. That is a key priority for me.

The second internal priority relates to the government science and engineering profession generally. Here I am looking at career pathways,

options for talent development and capability in the various individuals around government, in government laboratories or elsewhere to ensure that we optimise the chance of getting the very best people and that that group can also be part of the science network.

The third internal priority is about the pull for science advice and the development of an appropriate mechanism to ensure that all departments know how best to ask for scientific advice and how best to use it. With Chris Wormald, who is in charge of the policy profession, we have started to look at and discuss a piece of work on how we might look at enhancing that. These are the internal things that I am concentrating on.

There is a similar lead external priority on connectivity across the science community to ensure that we get the appropriate input from the science community. I want to be clear that when I say the science community I do not mean just academia but the industrial and private sector science base, where there is a huge opportunity to hear from people what is important. We need that network externally to ensure that we have the right input.

On the specifics, I want to focus on the industrial science base or private sector science base as it relates to the ambition to spend 2.4% of GDP on R&D. That is a crucial part to get right. We need to think about both the R part and the D part of R&D to make sure that we get that right. The international position in relation to that is clearly crucial. Thus my second external priority is about the industrial science base and the international position.

The third immediate external priority is where traditionally the Government Office for Science has focused on science for policy, science for resilience—in relation to security and natural problems such as flooding—and science for the economy.

I am exploring how we add a fourth, on science and citizens. It is incredibly important that science is not seen as separate and done only in laboratories by people wearing white coats but is seen as relating to everyday life and where citizens can think of themselves as both participators in science and demanders of science.

Those are the things I am concentrating on in these initial couple of months.

The Chairman: Thank you very much. In due course we will have an opportunity to see how things are progressing, but today we will not go down that path.

Q3 Lord Mair: I ought to start by declaring some relevant interests. I am currently the chairman of the Science Advisory Council at the Department for Transport. I am from the Department of Engineering at Cambridge University. I am a fellow of the Royal Academy of Engineering and of the Royal Society. I am also president of the Institution of Civil Engineers.

My question is: what is your initial assessment of the state of science advice to government departments? I am particularly interested in what

you have to say about chief scientific advisers—CSAs.

Dr Patrick Vallance: We have some outstanding CSAs and we have some gaps in the system. We need to look at a more consistent way of appointing CSAs. At the moment, of course, it is the host department that appoints CSAs with the advice of the GCSA. I am looking for a bit more consistency in what we need to see in the job description, the accountabilities and assessment to make sure we get those parts right.

We could do more to join up across the CSAs. I think they all think that as well. One thing that a few of them spoke to me about before I joined was the notion that they could be greater than the sum of the parts if we could get them working. One of the first things that I did was to organise a couple of days, which we are going to have soon, to get everyone together to look at what it means to be a CSA network as well as what it means to be a CSA. That is a key part of it.

The other mechanisms for science advice include the sorts of bodies that you are on—in other words, the groups of external experts that feed into the departments. The one that feeds across government is the Council for Science and Technology, which I think has been effective. It is a very good group. It has a diverse membership from industry and academia and covers a wide range of scientific interests. It has been an effective mechanism to feed in independent external scientific advice. Of course, expert groups are convened as necessary on specific topics. We had one last week on blockchain and we will get others as need be. My impression is that it is generally pretty good, but there are a few areas where there is an opportunity to make sure that this is world class and can be joined up.

Lord Mair: What is your view about the consistency across departments? There are some cases where the CSA is on the department's board and there are other cases where that is not happening. That seems to be a cause for some concern. What is your view about that?

Dr Patrick Vallance: That is exactly one of the areas I want to look at. I do not know yet whether it is essential to have everybody on the board or for things to look identical across departments, because departments vary quite a lot. The MoD has a big research budget, DfID gives out a lot of money and the Department of Health gives out a lot of money through grants, so the make-up of the departments is rather different, and while I want to standardise I am not looking for complete uniformity across.

That is a long-winded answer to your question about the boards. I do not know whether they should all sit on their board, but I want to look at that as part of the standardisation and take some advice on that. We need to be a bit more consistent about grade, position and influence in departments. There is no point having a CSA who cannot be heard in the department.

Lord Mair: Certainly there is a risk of a CSA feeling sidelined if he or she is not on the board, or even if they are on the board they are somehow put in a position where they are not really listened to, and that is the concern, is it not?

Dr Patrick Vallance: It is a concern, and it is one that I take very seriously. I want to make sure that we get right. Of course, a lot comes down to the support that that individual gets not only where they are in the department but in the infrastructure around them, and increasingly—this is where the other CSAs could be helpful—the support they get from their colleagues.

Most of the problems that any one department faces will not be in the direct area of expertise of the CSA, so he or she needs to make sure that they can pull on their colleagues as well as of course on external experts. That will enable greater weight to be given to their opinion. There is absolutely no point in having a CSA who sits off on one side and thinks thoughts and nobody can hear them or wants to listen to them.

Lord Griffiths of Fforestfach: From your initial statement and what you have just said, it seems to me that your job has two areas to it. The first is that you are running a whole operation of advice almost like a department, and on the other hand you are meant to be there advising the Prime Minister and members of the Cabinet.

On the second of those, how do you plan to do that? Would you plan to have a Cabinet committee or sub-committee dealing with science and science policy? Would you plan to have regular meetings with members of the Cabinet or the Prime Minister offering advice, at a very high level, as opposed to managing a CSA in a particular department?

Dr Patrick Vallance: Since I started we have had a lot of interactions with No. 10 and we have interacted with a number of people including the Prime Minister over the speech she gave recently on science. We were very involved in looking at some of the areas that should be covered and at some of the announcements that were made in that speech. That was an exemplar of how we can work with No. 10 and the Prime Minister. We organised a meeting of the Council for Science and Technology on the same morning as the speech. The Prime Minister spent quite a significant amount of time with the council and we discussed a number of areas of interest to the council and to the Prime Minister, which has given us a good framework for how we should work over the next period.

Lord Fox: I think we all share your thoughts about the status of CSAs and their ability to affect the departments they are in. We have heard you say that you suspect that there are some who are not operating at the level that you would like them to operate at. Do you have the clout and the support to push the ones that are operating at too low a level up, or is this going to be a process department by department in a sort of hand-to-hand struggle?

Dr Patrick Vallance: The immediate priority is the departments that do not have CSAs—

Lord Fox: Yes, that is the starting point.

Dr Patrick Vallance: —to ensure that they get their CSAs in place and we get those job descriptions and accountabilities right. I have to say

that I have experienced nothing but a strong, positive reception from Permanent Secretaries and others in those departments to get that right.

Lord Fox: You are dependent on the Permanent Secretaries largely in getting that done, are you not?

Dr Patrick Vallance: Correct. I am in the process of writing round how that should operate. I do not want CSAs appointed without coming through the GCSA. I want to make sure that there is a very clear mechanism to get GCSA input from the very beginning on the job description, on all aspects of the interview process and in making sure that we get the assessment process right—that answers your initial question—so that this is not done solely within the department but is also done in the Government Office for Science.

Q4 Lord Vallance of Tummel: Can we look at the flip side of Lord Mair's question? When government departments have received scientific advice, how good are they at absorbing it? Are there some that are very good and that are role models, and are there any lessons we can learn from that? Equally, are there some that are particularly bad that may not understand the language of science? Are there any lessons we should learn from that?

Dr Patrick Vallance: I spent a lot of the first couple of months going round and meeting the Permanent Secretaries in each of the departments to try to gauge how they think about science advice and how they would like science advice in their departments.

There are a number of quite useful examples coming up as to where people pull in science advice very effectively. A couple of years ago, for example, the MoD had quite a significant science review. It asked the GCSA to come and look at the department and at how the whole process worked, and that led to a rather formal output of advice on how the MoD could best utilise science advice both internal and external. In fact, one of the recommendations was about more effective external linkage. That is a formal way to do it.

There are examples that I have come across recently. I was in the Department for International Trade yesterday and the Permanent Secretary, Antonia Romeo, said, "I would love to get not my CSA alone but the CSAs to be involved in helping us understand the areas of science that would be most useful for this department". That is a very open and encouraging way to think about it, and we offered to put together groups to come to do that.

In contrast, some departments struggle to see where science is relevant. One thing I have noticed is that it is easy to think of science as something that takes place in laboratories and, "I don't need a biologist or a chemist in this department". It is true, you do not, but science is fundamentally about problem-solving and there are many branches of science that can help to solve problems. Reframing the question as "What are your biggest problems?" and allowing us and the CSAs to try to help solve them is effective, and we are doing that with a number of departments.

We also have quite a nice pull from the policy profession, which Sir Chris Wormald leads, to look at how we can think about giving—I do not want to say scientific education, because that is the wrong thing—a greater understanding of where science can make a difference to those making policy in the policy profession as part of an educational module which the Royal Society is going to help with.

Defra recently looked at its scientific advice and did a use and impact review, which is due to read out soon, to see how they can best optimise it, and I would take that as an example of best practice.

There is one area where it has been difficult, to say the least, over the past year in the challenges that were faced. MHCLG has pulled very hard on the Government Office for Science to help with various aspects post Grenfell. Three CSAs have been deeply involved in trying to help with that, and they are now in the process of appointing a CSA in that department. I am rather encouraged by a lot of pull from different departments, and where it is trickier we can at least open the conversation with, “What are your problems, and how can science help to address them?”

Lord Vallance of Tummel: Can I push you a little further on that? There is no need to name names, but for those that are trickier do you have any sense of why that is? Are we back to the two-cultures problem or what?

Dr Patrick Vallance: At heart it is the two-cultures aspect that needs to be looked at. The positive side to this is that there is absolutely no resistance to the idea that there could be help from science. It is more a matter of articulating in a way that is accessible to the departments where science can help. We have undertaken a piece of work to try to come up with, “This is where science would make a difference in the problems you have identified”. A few examples like that would pull things through much more effectively.

The Chairman: By the way, I should have declared my own interests. In the context of today, I have no interests to declare.

Baroness Neville-Jones: I want to follow up on your point about the utility of science in solving problems. I should declare that I have an interest, being a member of the Engineering and Physical Sciences Research Council.

Lord Griffiths asked you whether you can get into government business so that you recognise an issue where science can make a difference. It seems to me, if I might say so, that if you are entirely dependent on the department recognising that it needs scientific advice that is quite a limiting factor. Bernard Silverman has written some very interesting articles on his experience as CSA in the Home Office, where he used quite a lot of modelling to solve problems that were not “scientific” or where it was not obvious to a lay policymaker that science could help him, but it provided a solution.

How do you tackle the problem of identifying issues that are not necessarily obvious to policymakers, not because they are being dumb

but because it just did not occur to them, where your people could intervene and really help policy to move forward?

Dr Patrick Vallance: I just want to be clear that the point I was making about looking at departments where there is not much pull for science was that it is a way at least of making the first entry point something that they want to try to answer.

In answer to the broader question, in both the Government Office for Science and some of the departmental CSAs' offices, horizon-scanning goes on and there is a lot of input from external people as to where things are coming up. The Government Office for Science has started the scan of scans, because there are many people doing horizon-scanning. We have aggregated the scan of scans to try to look at cross-linked themes that are coming up, which is going to be quite important.

The other example in which there is quite a lot of interest at the moment is how data visualisation tools can help you to understand something that you did not understand before. You probably saw a rather nice article by Kofi Annan in *Nature* about how he had his eyes opened by the data visualisation of various different trends in Africa that made him think about things quite differently. I want to push data visualisation as a key tool to try to get to some of these trends and opportunities, which are not obvious when you look at the current problems.

Q5 **Lord Maxton:** I start by saying that I have no interests to declare.

There are several points to make. The first is: to what extent are you covering technology as well as science and the interaction between the two of them? It seems to me that the biggest changes over the last 20 years have been in technology rather than in science itself.

Dr Patrick Vallance: I am using the word "science" very broadly. I take it to mean engineering and technology, and technology is certainly one area we are looking at with the new disruptive technologies. I spoke earlier on about blockchain as an example of one of those technologies. Of course, there are many others across biology, engineering and other areas that will change all sorts of things, from the ability to edit genes and potentially almost for the first time to cure diseases—that is a pretty major change to how we think about health services—through to autonomous vehicles, robotics and advances in things such as quantum computing.

They will have huge implications across all sorts of areas. Technology is definitely part of what I am interested in and one of the areas that I have already spoken to various groups inside government about as to how we need to think about getting ahead on some of those technologies, or at least getting in at the right time.

Lord Maxton: The problem is that science thinks in 20-year terms and elections are every five years. Is there a clash of interests between these two?

Dr Patrick Vallance: Probably, but, as I said at the beginning, one job of the GCSA is to think long term. I do two things in this role that are not easily done with the way government works because of the timelines. The first is to look across government, which is not always done in the departmental structure, and the second is to take a long-term view of things.

That does not answer your question as to how easy it is to make that happen, but it answers the question in terms of its intent to do that. I see that as a key part of this role.

Lord Fox: I declare that I have no interests relevant to this inquiry. In your answer to the previous question, I can see how helping them to solve a problem by using the techniques that you have would be a way in which the science advisers would get an "in", in a sense, and be seen to be useful, but are you suggesting that it is the role of the CSAs to try to enhance or deliver scientific literacy and the ability to visualise data and all those things within a department? Is that their role? If not, whose role is it in the department?

Dr Patrick Vallance: I do not think that the CSAs can implement data visualisation in a department. They do not have the execution authority to do that. They can certainly be part of ensuring that the opportunities presented by data visualisation are understood in departments and can be part of the science and technology assessment of how best to achieve that. That is really where they come in.

I have already said that I have raised this issue with a number of Permanent Secretaries who are interested in looking at this. There is work going on already. As GCSA I can help get that into the profession as a whole as a pull mechanism, because there has to be pull for this. I do not think it is practical to suggest that CSAs can be accountable for getting data visualisation implemented across government. That is just not what they have to do; it has to be within the departments.

Lord Fox: That is what I was thinking, but again it is department by department, Permanent Secretary by Permanent Secretary. It is not possible to do this at a more macro level.

Dr Patrick Vallance: Ultimately, it gets implemented in departments. Should it be discussed and pushed centrally and across? I think it should.

Lord Fox: And who would push it in that case?

Dr Patrick Vallance: At the regular meetings of the Permanent Secretaries where we start looking across opportunities, this is one of those that goes across, and clearly departments such as DCMS are also interested in this area, so there are departments that could take a lead on this type of approach.

Lord Fox: Also the HCLG, because a lot of visualisation is required?

Dr Patrick Vallance: Yes.

Lord Griffiths of Fforestfach: Can I come back to the question my colleague Lord Maxton asked about technology and ask about a practical

element that is emerging?

The Irish border question seems to depend in some major way on technology. It is argued that if we had the right technology we could solve the issue. I am not concerned about the political dimension, but let us assume that the Prime Minister or a senior member of the Cabinet came to you and said, "You, Dr Vallance, are the Chief Scientific Adviser to government. I am reading various accounts of what is possible and what is not possible in technology. What is your view?" What do you feel your responsibility as the Chief Scientific Adviser to government is in looking at such a request?

Dr Patrick Vallance: We would look at that request and look at the technologies. We would probably convene an expert panel to help us to understand the technologies that could be applied to that. We would provide a report to the Prime Minister indicating where we thought there were opportunities or evidence gaps. It would not be a recommendation as to what should happen, but it would be a report that indicated what the state of the technology is, how quickly we thought that might change and where it could have opportunities and risks.

Lord Vallance of Tummel: Would you need to be asked to do that, or are there things that are of such importance that you might do them on your own initiative?

Dr Patrick Vallance: There definitely are things that we would do on our own initiative. One area related to that, which is blockchain or distributed ledger technology, came out of the Government Office for Science and is being looked at in a number of areas. There will be other things that come up that we will do proactively. Clearly we need to make sure that not everything we do is what we think is important and we get the balance right between the requests and the areas that we want to push.

One thing again that I have spent some time doing over the first couple of months is meeting with groups of scientists from different areas to make sure that I hear very clearly from them what emerging science and technology they think needs to be looked at and could be applied. We will pick carefully the ones we want to look at.

Baroness Neville-Jones: It has always struck me that distributed ledger technology could be useful in the context of the Northern Irish border. You may not be able to answer this question, but has your help been sought on that issue?

Dr Patrick Vallance: We are looking at it for a number of indications, including that. Of course, Singapore already uses a type of that technology and some of the other ports have tried that, so it is an area that people are looking at.

Q6

Baroness Neville-Jones: Given my membership of the EPSRC, perhaps you will not be surprised to hear that I am interested in the kind of relationship that you hope to form with UKRI and with the individual research councils. What is your view of how that might work—obviously your predecessor is now installed there—because these are two big forces

in science and technology in the country?

Dr Patrick Vallance: First, I agree completely. UKRI is an important development. It allows all sorts of things to happen, including join-up across the research councils and interdisciplinary funding, which are crucial.

Baroness Neville-Jones: It always was the case.

Dr Patrick Vallance: It is a new mechanism for doing that. I know Mark very well and have met with him several times since I started. We are absolutely aligned in the belief that this needs to be a very close working relationship.

I have also met with nearly all the research council heads, some of whom I knew anyway and others I am getting to know. I have not met them all yet, because one has only just been appointed, but that direct relationship with the research council heads is also crucial.

The relationship also needs to build on the research needs of government. Feeding into UKRI with clarity what the research needs are will be an important part of this process. The areas of research interest that have now been published by 15 departments are a good start. Again, it is difficult to say that it is a perfect start. Some areas need to be tightened up and made more consistent, and some learning from each other as to best practice would help, but that provides UKRI with a very clear request list and UKRI can be the vehicle through which some of that research is addressed.

We need to think about how that loop is closed—in other words, how that research has really come back and helped government—to make sure that that part of the process is right. That is the internal government bit, and I think the best thing to say at the moment is that it is a work in progress.

There are whole other areas on which I have already touched, such as how we get to the 2.4%. Getting to 2.4% will require private sector investment as well as UKRI investment. I will be involved in trying to work out ways in which we can best achieve that. It will need UKRI and the Government Office for Science to work very closely together. There are clear differences—they are a funding organisation and we are not a funding organisation—but the close partnership between those two will be key.

Baroness Neville-Jones: When you referred to the funding needs of departments and you identified 15 departments, is that just departments or is that the needs of the country? What I am getting at is what the relationship is between that and the industrial strategy.

Dr Patrick Vallance: The areas of research interest built from the industrial strategy is a key theme running through them. This point came up earlier. We are also trying to look across the areas of research interest, because of course if everyone is looking down in verticals they miss an awful lot of things that could be crucial across.

Two things come out very strongly when we look across the areas of research interest. The first, not surprisingly, is data science. The other, which is perhaps also not surprisingly but in some ways surprises people, is behavioural science, which comes up as a big need right the way across all the departments. There are themes coming up that give rise to the question: if those are the key things across, what do we need to do to get those properly enabled with departments?

The final thing to say on the immediate relationship in the funding is the UKRI's strategic priorities fund, which is a mechanism to look at government needs and other cross-cutting funding mechanisms. I have been asked to be on part of the process to make sure that we get that right, and in fact I have the first meeting on that tomorrow morning.

Lord Fox: I am pleased that you mentioned the 2.4%, and specifically the need to get private sector investment in, because up to two-thirds of the additional investment will probably need to come from the private sector. This was announced within the framework of the industrial strategy. Who is accountable? You have mentioned that you have a role, and I am assuming that UKRI has a role. Who else has a role, and who is the lead accountable for delivering this target?

Dr Patrick Vallance: BEIS and the Science Minister. I have a role to give advice and input into that, as does UKRI. We are working very closely with BEIS on this on the road map and what needs to happen to be able to get to that 2.4%.

You are absolutely right that to reach this there needs to be a concerted and clear effort on private sector inward investment. That relates to a couple of comments that I have made, one on engaging properly with the private sector science base, which I know about having spent 12 years in that sector after I left academia. Some 165,000 people work in the industrial science base in the UK, and probably 110,000 of those are scientists or engineers, and between them they spend roughly £16 billion, which is more than the public sector is spending, so it is quite sensible to try to get them engaged in asking the questions as to what the priorities are, what they need to do, how we can link through to global companies to ensure that we get them engaged in this, and what might UKRI spend do to help enhance that. Those are the areas that I am going to be concentrating on.

Lord Fox: There has been an awful lot of focus on bioscience—or on medical science, in fact—and quite a lot of the people leading the process who come from that particular walk of life, including our Chairman and you. Are you satisfied that there is sufficient footprint in the rest of science to deliver this 2.4%, because it will not be done by bioscience alone?

Dr Patrick Vallance: It definitely will not be done by bioscience alone. I have made it very clear that there are a lot of people in the bioscience space and I am going to concentrate largely in other areas and give my advice where needed in the bioscience space. I want to be clear what I mean by this. My impression is that the ability to translate our outstanding basic science into things that are attractive to companies and

inward investment is an area that needs attention. That is the D part of R&D. I have a general concern that we talk about R&D as if it is one thing, and it is not.

Lord Fox: Is that not the Innovate part of UKRI?

Dr Patrick Vallance: I think it is more than that. Innovate is one specific part of that, but it is not the only part. In my last role as head of R&D at GSK, where I had a very large research budget, I was as interested in the nature of the basic science and the ability to access the basic science in departments as I was in the specific translational mechanisms that might come through something such as Innovate. Those things should not be carved up in thinking about the funding. Looking at the R&D ambition with a clear view of how you want to achieve each of those is an important part of what needs to happen.

Q7 Lord Griffiths of Fforestfach: I would like to move on to Brexit and its implications. The withdrawal Bill has huge implications for regulation and legislation in so many different fields: transport, border control, energy, broadcasting, policing, international trade, chemicals, medicines and so on. Do you feel that the CSA network that you have inherited has the scale to respond to this, particularly on the evidence-based assessment, and sufficient skills to enable you to do a first-class job?

Dr Patrick Vallance: It is important to recognise that inside the departments with big science areas—the Department of Health, the MoD, DfID or BEIS—there are a lot of scientists who are not part of the CSA network. That is the broader government science and engineering profession. There are lots of people who are working up from a policy perspective inside departments in these specific areas.

Where the CSAs can work, and we have regular meetings on this very topic as you might imagine, is in looking critically at the work as it is built up within departments and making sure that the connectivity with the outside world is correct when it comes to the research needs and acting as an independent senior scientific challenge to what is coming up. They are definitely not the people who are implementing this. That is being worked up in departments. Specifically, BEIS is handling the science aspects of this and has many people working on it. I meet often with the BEIS team on this.

Lord Griffiths of Fforestfach: I could imagine a situation in which there are issues of regulation on the table but the scientists in the department have an axe to grind about something or other. Can you send your own people in to challenge them? How does that work without creating real conflict? I am an economist by background and I am thinking of the debates that we have had. What is the equivalent in your area of the debates about monetary policy, Keynesian policy, the Bank of England, the Treasury and so on?

Dr Patrick Vallance: None of the CSAs is a shrinking violet. They know that part of their job is to challenge. Inside departments, the CSAs are set up in a way with a challenger function to be independent scientific advice in the department.

The same is true of my role and that of the Government Office for Science. How you challenge is quite important, as you well know. There are areas where we have challenged quite hard on some things, and as always with a challenge it is often initially not welcomed, but I would say that the general approach is that people want that challenge. Nobody knows the answer to some of these things, and they are looking for the challenge and the independent peer review of things. I have been impressed by how well this has happened.

Lord Griffiths of Fforestfach: Do you feel that you have the resources for the potential challenge that is coming?

Dr Patrick Vallance: It is a bit difficult to answer that. The resource in the departments to work up the science in the way we have discussed is being put in place. It is a bit difficult to know the extent to which the challenge function will be necessary within that, and it probably varies across departments, but the big science departments—the big science users—have good people and enough people in this area.

Baroness Neville-Jones: I want to pursue slightly what you have just said about having the resources to pursue a challenge function. Yours is an advisory network and presumably fairly slender in terms of people.

Dr Patrick Vallance: Yes.

Baroness Neville-Jones: In this country in the next 10, 15 or 20 years, we have to become a great deal more science, innovation and research-based or we are not going places. It seems to me that it is going to get to the heart of government. How do you see it working? Will we succeed in recruiting and putting into government departments people who have a more technological scientific base themselves, or is your service going to have to expand to ensure that sensible decisions are taken? Science is coming from the margin into the centre, so how do you see this role evolving, a role that as things stand does not have an executive arm?

Dr Patrick Vallance: First, I completely agree that science is central. Almost everything that we do, every decision that needs to be made and every development will be impacted by science. That makes this absolutely central to everything. It is one of the reasons I took this role. We are at a time when, if we get that science right, we have a very exciting future. If we get it wrong, we have a big problem. Getting it right is critical.

I was interested to read some historical work on the origins of the chief scientific adviser and a 1946 document that said, "We need a scientific Civil Service", which I rather agree with today, and it is something that we need to work on. One thing that we can do and I can do is be very clear about the needs of that Civil Service. At the end of the day, as you rightly point out, I cannot action that, but I can be very clear about the arguments and the consequences of not making sure that we have the right science advice. There are at least 10,500 scientists across the Civil Service in the government science and engineering profession.

Baroness Neville-Jones: Are they doing things that are relevant to

science?

Dr Patrick Vallance: Some of them are, and I spoke at the beginning about why that group becomes important. There is the broader issue of making sure that science reception and understanding is such that it can be used widely in departments, even by people who are not scientists, because science is, as you rightly say, everywhere. If you think of science as primarily about problem-solving, it will be key.

Lord Maxton: How far in the future do you look? If you are right, for instance, that the modification of genes or whatever is successful in curing illnesses, people are going to live longer. Is that being put back into the thinking of the insurance companies or whoever it might be who has to look at this?

Dr Patrick Vallance: It is certainly part of the activities that we are undertaking in looking at demography, what we think will happen to that and what the consequences of that will be.

Lord Maxton: To what extent is that relating down to other departments, which are not necessarily concerned directly with science?

Dr Patrick Vallance: I do not yet know how well disseminated that is and how far reaching that thinking is, but it is certainly one thing that is being looked at and thought about in terms of what we need to do to get that out.

Lord Fox: Returning to the science-is-all-around-us motif, and accepting what you say about it becoming central to all departments, it is, I think, fair to say that the vast majority of the employees in those departments and probably all the leadership are speaking science as a foreign language. In other words, what bit of it they do they have picked up because they are not scientists.

I am willing to bet that science is in a minority in the Civil Service. Given that, how can you hope to get it to be a part of the daily language of how people go about doing things?

Dr Patrick Vallance: To be clear, it is not true that there are no scientists in the leadership. I have come across two Permanent Secretaries who are mathematicians by training, and at least one, in Defra, who has a number of people, including a physicist and a chemist, on her board.

Lord Fox: I am pleased to be corrected.

Dr Patrick Vallance: There is some rather encouraging movement in that respect.

Lord Fox: I agree.

Dr Patrick Vallance: There is also, of course, the Civil Service fast-track scheme, which has a science stream. I talked at the beginning about my aim to try to get the internal bit right, and I think there are things that could be done to enhance the intake of scientists into that.

In the Government Office for Science over the past two months, we have had interns coming with PhDs and other things into government—one of

them is here—to spend three months on a project and learn about issues of policy and the policy application of science. I am bowled over by the quality of those people and by the opportunity it gives to broaden thinking.

I quoted the 1946 document specifically because I do not underestimate the challenges of that sort of cultural change. Nor do I underestimate the importance of making science an everyday thing in departments with the rapid pace and change of science and technology advances at the moment. It is crucial. This morning I had a meeting with somebody from the Royal Society on exactly this topic and on how we can start to think about enhancing this, which is key and will be tough.

Lord Vallance of Tummel: Lord Fox partly got my question in before me, but can I push it slightly further? We are back to the two cultures, essentially, and how you get the two cultures to speak a common language. Can you do that without tackling it at the educational level? It is all very well taking far more scientists into the Civil Service and so on, but you still run the risk of people speaking different languages.

Dr Patrick Vallance: This is an area that the Council for Science and Technology talked about when we met last week. It is an area that we are likely to want to do a piece of work on. We are not yet decided, but there was a strong recognition that the question of science as a fundamental part of society is crucial if we are going to meet the 2.4%, if we are going to make the industrial strategy work, if we are going to be a science-led nation in the future and, at a more parochial level, if we are going to get the Civil Service to be scientifically focused in the way that has been described.

That an approach to science starts right from an early age and is about how we should think about science in universities and the training that is offered in universities, and training in a world where interdisciplinarity becomes incredibly important. Scientific problems do not sit neatly in biology or biochemistry or engineering. They cross, very clearly, and there is quite a big role in that for a systems engineering approach as part of this.

Q8 **Lord Borwick:** I have no interests to declare on this.

What role do you expect to have or do you have in the Brexit negotiations now and in the future, in agreeing the UK's future participation in EU research programmes such as Euratom and in EU regulation?

To what extent is this going to be run by UKRI, and which of you, you or Mark Walport, will be in the lead in these negotiations?

Dr Patrick Vallance: The answer is neither of us, because this negotiation is with BEIS and the Science Minister assumes accountability with his team. Mark and I are very engaged with that team. I have regular meetings with them before and after they go to meetings with the EU negotiators. Mark and I are together in thinking about what the key areas are that need to be looked at. I am giving advice and input into

that and I am very close to all aspects of the science part of the negotiations, but I am not accountable for the negotiations. That sits within BEIS.

Lord Borwick: Are there differences of emphasis between you and UKRI?

Dr Patrick Vallance: I do not think so on this one. We are very aligned on the need to be international in our science outlook and to be very linked with Europe on research funding and the programmes that go on, and we are very keen to be part of the Euratom programme. There is a very common alignment between UKRI, the Government Office for Science and BEIS.

Baroness Neville-Jones: Could I ask a question on the issue of contact with other scientists and the problem of visas and immigration? My very strong impression of the academic world is that they certainly want to continue to be part of the programmes and they want the funding, but they attach even more importance to people's ability to circulate freely and still attract top scientists to this country. Is that a focus? Are you able to input on that particular issue?

Dr Patrick Vallance: Yes. It is a very important focus, and one only has to look at the number of Nobel Prize winners in this country who are first or second-generation immigrants to see that this is a massive part of our science culture. It is incredibly important for how we get ideas into the country. The immigration part, not only for researchers but for their families, is key, and Mark and I speak about it often.

Baroness Neville-Jones: I hope you make an impact.

Lord Maxton: Does technology not make people being in a country irrelevant?

Dr Patrick Vallance: No. I really do not believe that. Of course there are things that technology absolutely enables in collaboration at a distance, and that will become easier, but regular human interaction and scientists' ability to be in one place and to learn the unexpected are important. Why, for example, do so many Nobel Prize winners come from the Laboratory of Molecular Biology? It has to do with the way it is set up and the interaction of people. The Francis Crick Institute is set up in a similar way. These interactions are key.

In my last job I ran a global R&D organisation, and it was impossible to think that you could do that sitting in an office in London assuming that you had the organisation aligned, excited and bumping into each other to make the unexpected happen. I do not believe that that requirement will go away in any sort of near term.

Lord Mair: Are you confident that the UK will be able to be fully associated with the successor to Horizon 2020, in whatever form that takes?

Dr Patrick Vallance: I have no way of predicting that. All I can say is that it is very clear that the UK wants to be associated with that and has

made every signal to the EU that that is what is required and what we would like.

Lord Kakkar: Is there any preparation for the eventuality that that does not happen to understand what might need to be developed on the domestic science agenda to replace that type of interaction and funding?

Dr Patrick Vallance: Those are really questions for BEIS and not for me, but it is obvious that those of us who are involved in it would have thought about alternatives. The key aim is to become closely associated with Europe, as we are now with key programmes.

The Chairman: Dr Vallance, thank you very much indeed. We appreciate very much you coming today. No doubt we will have interactions with you in the future. In the meantime, we wish you well with all your efforts.