



HOUSE OF LORDS

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The Select Committee on Science and Technology

Inquiry on

THE RELATIONSHIP BETWEEN EU MEMBERSHIP AND THE EFFECTIVENESS OF SCIENCE, RESEARCH AND INNOVATION IN THE UK

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Questions 25 - 40

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10.40 am

Witnesses: Professor Alex Halliday, Professor Sir Robert Lechler

and Professor Ric Parker

USE OF THE TRANSCRIPT

This is a corrected transcript of evidence taken in public and webcast on
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Members present

Earl of Selborne (Chairman)
 Lord Cameron of Dillington
 Lord Fox
 Lord Hennessy of Nympsfield
 Lord Hunt of Chesterton
 Lord Kakkar
 Baroness Manningham-Buller
 Baroness Neville-Jones
 Lord Peston
 Lord Vallance of Tummel

Examination of Witnesses

Professor Alex Halliday, Vice-President, Royal Society, **Professor Sir Robert Lechler**, FKC, President, Academy of Medical Sciences, and **Professor Ric Parker** CBE FREng, Director of Research and Technology, Rolls-Royce plc, representing the Royal Academy of Engineering

Q25 The Chairman: On behalf of the Committee, I welcome our three representatives from the learned societies to our session. We are most grateful to you. We are being recorded and broadcast, so you may wish to note that. Could you therefore introduce yourselves for the record, and, if you would like to give a brief opening statement, feel free to do so at the same time. Perhaps we could start with Professor Halliday.

Professor Alex Halliday: I am Alex Halliday, a professor at Oxford University and vice-president of the Royal Society. I would like to say a few things. I left this country in the mid-1980s to go to work in America because even though, as I saw it, I was very successful here, the amount of funding was not adequate for doing what I needed to do science-wise. I went to America and built a big research programme and was there for about 12 years. I then moved to Switzerland and was there for about six years, so I have experience of the Swiss system. I have also had experience of trying to organise European Union networks through Switzerland. In 2004, I moved to Oxford and became a professor there. After three years, I became head of science and engineering at Oxford University, which are the non-medical sciences, and so I have a perspective on the critical dependence we have nowadays on European Union funding in non-medical science and engineering. I stepped down from that role about a year ago and became vice-president of the Royal Society, which is why I am here today.

Professor Ric Parker: Good morning, your Lordships. My name is Ric Parker and I am here on behalf of Dame Ann Dowling, the president of the Royal Academy of Engineering. I am the chairman of the research committee of the academy. My day job is director of research and technology at Rolls-Royce. I am also the chairman of the Clean Sky joint technology initiative in Europe, which is a €4 billion research programme. I have been chairman of that for the last three years, so I think I have a fair amount of interaction with Europe, both in my role in the academy and at Rolls-Royce. Rolls-Royce is one of only two UK companies in the top 50

in Europe that are beneficiaries of the Framework 7 research funding, the last complete programme, so I think we have a fair amount of experience in that area.

Professor Sir Robert Lechler: Good morning. My name is Robert Lechler. I am the recently appointed president of the Academy of Medical Sciences, as of six weeks ago. I have two day jobs; I am vice-principal of King's College London, the biomedical half of the university, and I lead King's Health Partners, one of the UK's six academic health centres.

By way of opening remarks I would wish to say that there are four material issues, as I see it, for debate here. The first is funding, and Professor Halliday has referred to that. The EU has become an increasingly important funder. We are a net gainer through our participation in the EU. The second is that collaboration is increasingly important in addressing major questions in science, and the EU has been a very important catalyst of co-operation and continues to be so. Thirdly, people are key to success in science and the mobility of people is essential. We enjoy the freedom of movement of scientists, and the UK receives a lot of continental European scientists into our faculties. Finally, I see the harmonisation of regulation as a very important enabling step in pursuing high-class research.

Q26 The Chairman: Thank you very much, Sir Robert. We would like to start the questions now, if you have nothing further by way of introduction.

Could I address my first question specifically to Professor Halliday, to clear up a point about which I am a bit confused in the evidence that you have kindly submitted to us? You have given us charts which show, as indeed the evidence suggests, that the United Kingdom does well from R&D funds in the European Union. I am looking specifically at the written evidence from paragraph 15 onwards, which shows the balance of framework programme and structural funds. But then, in the recent report put on the Royal Society website, figure 8, which adjusts for total EU research and development funding, with structural funds added, it appears that we are not doing at all well. In fact, it states that the UK receives the third least funding out of all 28 member states. Could you help us by reconciling these two observations?

Professor Alex Halliday: Yes, we do extremely well in framework funding—the competitive research grant side—so it is very important for our university sector in particular. Regarding fundamental infrastructure issues, we do not have quite the same issues that places such as Poland have; a lot of funding is going to countries such as Poland where they need to rebuild. Parts of the UK get that funding, such as Cornwall, parts of Scotland and parts of Wales, where there has been a need for investment, and the European Union has been providing some of that funding for infrastructure. However, the scale of what is needed in the UK compared with what is needed in some of the other countries in the European Union is not the same at all.

The Chairman: I am still a bit mystified, because in your evidence to us you show €7.1 billion as the figure—I am looking at Germany now rather than the United Kingdom—at the top of the list for Framework Programme 7 and €4.9 billion for structural funds, which is not too bad at all really, compared to most other countries, and us at €6.9 billion, and doing, as you say, not at all well on structural funds at €1.9 billion. Yet when you convert that in your figure 8, Germany is doing even less well than us. I do not see how these two figures stack up.

Professor Alex Halliday: Figure 8 is normalised for GDP, which makes a massive difference to those figures.

The Chairman: So when you normalise for GDP, and if you take structural funds as if they are for research and development, which of course they are not necessarily, you have a position where, quite frankly, the UK, Germany and France are doing rather badly.

Professor Alex Halliday: Yes, and I think that is recognised.

The Chairman: But is it logical to treat structural funds in this way in your chart?

Professor Alex Halliday: Maybe we could think about whether we should have presented them in that way or not. We were trying to be clear with the evidence we had in terms of normalisation for GDP. The key issue for us is that the UK does incredibly well out of framework funding for research, which is the big part that we deal with. The case is not as strong on what infrastructure is needed in the rest of the UK. In the case of Germany there is also, of course, the fact that it has a bigger industrial sector in many respects that can link into European programmes, so there is another issue there. Typically, its industry side is much more successful at getting framework money than our business side.

Lord Kakkar: Just to follow up on that, is the basis on which the allocation of structural funding is made different? It is not by the competitive nature and the excellence of the applications made but rather by local need. Is that correct?

Professor Alex Halliday: I do not honestly know and I should find out about that, but maybe Ric knows.

Professor Ric Parker: I can clarify that. We are talking here only about the element of structural funds that is directly linked to the research programmes, not overall structural funds. The structural funds are allocated separately on the basis of local need, as you say. There has been a directive more recently from the Parliament that a proportion of those structural funds should be linked directly to the research programmes and provide research infrastructure, but it does not actually move where those funds are allocated in Europe, so they fall where they fall. As you say, as a proportion of GDP, Germany does not do very well, but the former East Germany still benefits significantly from structural funding.

Lord Kakkar: Do you think that is an appropriate way to make that allocation? Generally, if I understand things correctly, if we have the opportunity to invest in infrastructure in science in the UK on the basis of competitive bids, those would be independently, rigorously and objectively assessed against criteria and against excellence, and then the funding for those important infrastructure investments would be made on the basis of excellence. That is not the case with this particular funding stream in Europe. Does that undermine it to an extent or is that the appropriate way for those funds to be allocated?

Professor Ric Parker: I will not argue as to whether it is appropriate or not, but I think it has a different purpose in mind in the eyes of the European Union. It is to stimulate infrastructure in areas that previously would be unable to afford that investment themselves, so I think that is the primary directive. Large infrastructure projects, such as the new fusion torus down in France and CERN, are quite separate from these decisions as to how the local infrastructure funds are allocated under that budget.

Q27 Lord Peston: I have two questions for clarification. The first is that the House of Lords has only been back two days and I cannot work out what all these short names for countries are. Can you tell me where “Mal” is?

The Chairman: Malta.

Lord Peston: Thank you. The real clarification that I need concerns the fact that all these two pictures tell us is what you get. Is that right? They do not tell us anything yet about what you do with what you get or the criteria for allocating the funds. This simply says that this is an outcome story. Am I right about that?

Professor Alex Halliday: How well the UK does in science and technology, as well as in other areas of academia, is measured by things such as the UK’s research assessment exercises or, alternatively, by citation analysis, bibliometrics.

Lord Peston: I know about that, but this does not tell us about that. All this tells us is what we get.

Professor Alex Halliday: It is a contributor to that as regards the funding, yes, so at the same time as our funding has gone down in real terms from UK government sources, we have had this other source of funding that has come in to maintain the UK’s excellence.

Lord Peston: Fine. We will come on to what we do with what we get in the questions.

Baroness Neville-Jones: I, too, need some further clarification, if you do not mind. What precisely is the nature of the link between research and this research-related structural funding? What criteria do they use to determine why there should be this add-on?

Professor Ric Parker: The intention again was to stimulate research capacity as opposed to research excellence in areas that were a little below the line.

Baroness Neville-Jones: Does it mean economic development of the area? What does it mean?

Professor Ric Parker: It is channelled in two ways. It can be channelled into physical infrastructure, creating new laboratories or new facilities. Some regions have chosen specifically to allocate it to stimulating local SMEs to engage in research programmes where they would not engage otherwise. Some of the structural funds are directly linked to some of the large European programmes, such as the Clean Sky programme that I run. They get tied together and become a boost to the total pot of money available to achieve that programme’s objectives, but they are constrained because they are geographically allocated. We do not have the freedom to move them around.

Baroness Neville-Jones: So there is a lot of discretion in there, is there not, if there is that degree of variety?

Professor Ric Parker: There is no discretion on behalf of DG Research or any of the major research programmes in where structural funds fall overall. That is handled by DG Regions in Europe and has nothing to do with DG Research. The cross-linking came fairly recently when there was an instruction under Mr Barroso’s presidency that a certain proportion—I forget the exact number—of structural funds should be used directly to support research infrastructure and, as I say, that has been loosely interpreted to mean either physical infrastructure or encouraging more engagement in a local region.

Baroness Neville-Jones: It is that area where the UK does relatively badly?

Professor Ric Parker: Simply because we do not get much by way of structural funds at all, not because we are not good at using them for research purposes.

Baroness Neville-Jones: I see. So it is a small proportion because it is a small proportion?

Professor Ric Parker: Yes.

Q28 Lord Kakkar: Has any kind of assessment been made in determining how effectively the structural funding has been used over time by the European institutions? Has the investment resulted in increased capacity, which in turn has resulted in the delivery of research excellence, for instance? Would it be fair to say that if those funds had been invested elsewhere in the European Union to drive infrastructure development—for instance Germany, France or the UK—the research outputs might have been greater?

Professor Ric Parker: I am not aware of any such analysis, no.

Q29 Lord Hunt of Chesterton: In yesterday's *Guardian* there was an article by a Dutchman who was being critical of Britain's approach to joining the EU. The point he made, which I think is very interesting and relevant to us, was whether we regard Europe in a transactional way or a transformational way. Everybody is looking at the beans and how much money comes in, but the question is whether our involvement in the programmes is transformational. Looking forwards instead of always looking backwards, are there ways in which one can envisage further transformational changes to science, technology and industry where membership of the EU would help us?

Professor Sir Robert Lechler: Again, I am concerned that we do not lose sight of the fact that the UK does very well out of the competitive research funding allocation. We have focused on the structural funds, but as regards the research funding we put in 11% of the budget and we get back 16%, and that is a fairly consistent pattern. That reflects the quality of UK science of course.

On the non-transactional aspects, I would come back to my opening remarks. I think that collaboration and big science and so on are increasingly important to all scientific disciplines, and I think in that sense the EU has been very much a catalyst for that kind of collaboration. I would also observe that over the last decade or two there has been something of a shift of collaborative links between the US and the UK, and continental Europe and the UK. I think that has been very positive, because in some ways, practically, it is easier. I think the mobility of scientists between countries is another very important transformational element. The fact that 30% of the European Research Council grantees working in the UK are from continental Europe is an indicator of the level of mobility and how much European funding supports that.

Another aspect is the industry issue. In its 2014 manifesto, the BioIndustry Association observed that the harmonisation of regulation was one key reason why major pharmaceutical companies had chosen to put their European headquarters in the UK. All those things are relevant to transformational as opposed to merely the transactional, aspects of money.

Professor Ric Parker: I agree. I would add that one of the major transformational contributions is in plugging some of our major skills gaps, even on the research side alone. If you look at engineering doctorates in particular, only 39% of the doctorates completed in the UK are by UK nationals, and we depend on other non-UK European nationals to come

and do another 14% of the doctorates in this country. Without that sheer manpower to drive our research forward, we would be in a much poorer state. I think the comments made are quite right. We get too hung up on the straight, “We’ve put 50p in. Do we get 60p out or 40p out?” That is not the nub of the argument. The nub of the argument is what the overall benefit is. There are huge benefits, as has already been said, not only in the skills gap from mobility of researchers, both in and out of the UK, but from the sheer collaborative framework in Europe, which adds to European competitiveness as a whole.

Lord Hennessy of Nympsfield: Is that 39% for the arts and humanities as well the sciences?

Professor Ric Parker: I only have the figure in front of me for engineering. I can probably find the figures for overall PhDs.

The Chairman: Perhaps if you leave that to one side and if you need to send in written evidence later on, that would be helpful, or we may have it ourselves.

Professor Alex Halliday: I wanted to say that there are of course big European collaborations, such as CERN, which are there as European collaborations but which involve organisations and individuals who are not part of the European Union, but at the same time the opportunity to influence many of the things that happen in Europe is greatly improved by the fact that we are members of the European Union. That is particularly true in framework funding where we have had a disproportionate influence and we do extremely well in getting the funding, and in being able to discuss the things that we should develop within Europe, in a way that you cannot if you are based in Switzerland, for example.

Q30 Lord Kakkar: When we look at the initial public opinion polls on membership of the European Union and the evidence that we have received so far to this inquiry from the scientific community, it appears that the scientific community is more enthusiastic about European Union membership than the public at large. Do the national academies plan to engage in the wider debate with regard to European Union membership? If so, how, practically, are you going to do this and, if not, who do you think should be making the arguments for science and European Union membership?

Professor Alex Halliday: I think it is the role of the academies to lay out the facts so that everybody is aware of them, whether you are for or against, and that is the main thing we have been trying to do. We produced this first report about the funding side just before Christmas. There is another one coming along on mobility issues and a third one on regulation issues. Those will be available for people to see collations of the evidence and for people to think about what being part of the European Union brings to us. That is the primary role that the Royal Society, in particular, has to take part in.

There is no question that individuals such as Paul Nurse and Venki Ramakrishnan have come out and been quite vocal about their views, just as the universities have spoken up on this very clearly. As an academy, it is our job to try to present the evidence to help inform debate. That is the primary role. Some of the evidence could take a bit of unpicking, and that is where individuals may be able to play a bigger role than hitherto. For example, we show in the Royal Society report that the overall contribution of the European Union is about 3% of R&D in the UK. If you look at Oxford University, which is one of the leading universities in the UK, and if you take the science and engineering part, the non-medical sciences, the research funding that we get from the European Union is equivalent to about half of what we get from the whole of Research Councils UK, which is several research councils combined and

only about twice what we get from the European Union, so it is a major amount of money that we are getting. One of the reasons why we are so competitive in the European Union in this context is because we have leading academics and institutions in the UK that can go in and get that funding and be competitive in the broader playing field of Europe. That is a great advantage and it has been very important for the growth of research in top institutions in the UK. If you talk about public perception, to go back to your original question, the public has probably heard that universities think they are great and that there is scientific and bibliometric evidence for that. They have probably also heard David Cameron talking about how proud he is of UK universities as one of the things he feels has done really, really well in this country. If the UK is about trying to achieve excellence, despite its size relative to other parts of the world, I think there is a very good story to tell about the way the European Union has fed into that excellence over the last 10 years or so.

Professor Ric Parker: From the academy's point of view, we take the same line. We want to ensure that the debate is science and data rich. As an academy, we are not going to lobby for any particular viewpoint. There are other organisations lobbying out there, subsets of our congregation, such as Universities for Europe and Scientists for EU, which are taking a very firm opinion one way or the other. To build on Alex's point, we need to get the facts in front of people that the UK is a significant beneficiary from European programmes both financially and, more importantly, for the richness of our own research base and the people participating in it as a result.

Professor Sir Robert Lechler: The Academy of Medical Sciences has a similar position in that we wish to ensure the debate is fully informed. We may engage with the media to make sure that information is disseminated as widely and as effectively as possible. Influencing the debate is a different issue and we have not taken a decision on that. I suspect we may find ourselves surveying our fellowship to make sure that I am representing the fellowship's view. Time will tell. It is early days in this whole process and we do not know what the date of the referendum will be, and so on. We certainly want to ensure that the debate, from a science point of view, is as informed as possible.

Q31 Lord Peston: I am supposed to raise the question of EU funding and what is called the vitality and productivity of our science base. I am not clear myself whether my question means specifically EU funding—namely, that it has special characteristics that are especially helpful—as opposed to domestic funding. Could you comment on that? Are there aspects of EU funding that are especially conducive particularly to the productivity of our science base?

Professor Alex Halliday: I think you heard recently from Steve Cowley on the impact of EU funding and Europe as a whole and what it has done globally to science. I think that is very apparent if you look at what America has been like regarding major scientific collaborations and what Europe has now come to be like regarding such scientific collaborations. It is a phenomenal story of success of investment in large-scale collaborations where they are not exclusive but they are based in Europe. There is an engagement and the UK plays, as I say, a disproportionate role in that because of the excellence of the science base here. We get a large amount of money back to our research that goes on here in the UK. It has become critical in times of fiscal restraint to have that funding. We also exert a huge amount of influence in being able to set the science agenda not just for Europe but for the world, because Europe is becoming a leader in areas such as particle physics and people are moving to Europe, and less to America, because this is the place to be. It gives us an opportunity to

do things that are truly wonderful on a global scale by having, if you like, a disproportionate influence on what can go on.

To go back to what Robert said in his introductory remarks, mobility is very important from the point of view of getting people to work together and communicate. There is funding for that in the European Union and we get a large amount of money for that out of these framework programmes. It is also particularly important for young people who want to be part of something bigger than just the UK, France or Germany. They get a great deal out of spending time in laboratories in other parts of Europe as a result of those framework agreements. Regarding the legacy for future generations of scientists, it is going to be immensely important.

Lord Peston: In my notes it says that the EU funding programmes have a longer time horizon. Could you confirm that?

Professor Ric Parker: Typically, they are seven-year programmes. Framework 7 was a seven-year programme. The new Horizon 2020 is a seven-year programme. They are 10-year programmes, but the grants are allocated for seven years and then burn off over the final three years of the programme, which usually overlaps with the following programme. It is one of the strengths of Europe that the UK could learn from: that we have this consistency of objective and financing and we can plan, both from an industry point of view and an academic point of view, on these programmes being there. We know what the major themes are over this long-term horizon, and it does aid planning, recruiting of staff and other things if you know that there is a programme here that is going to run for 10 years and we are going to take a major part in it.

Lord Peston: I must have misread my notes. I assumed they meant the EU was interested in payoffs in the further distant future rather than the short term.

Professor Ric Parker: There is a balance across the spectrum of what we call the technology-readiness level. The European Research Council is funding stuff with long horizons research for the future. The framework programme, Horizon 2020, tends to concentrate on collaborative research and the pull-through of technology from the research base into European industry, so you have that complete spectrum within the European funding.

Lord Peston: I have one last supplementary specifically to Professor Parker. You said you were connected with Rolls-Royce. Let us carry out a thought experiment and assume that funding from the EU dropped drastically. I take it that the private sector is part of the science base?

Professor Ric Parker: Yes.

Lord Peston: Do you think there is any possibility that the private sector would make up the difference if we lost money from the EU?

Professor Ric Parker: No, I think the private sector is already spending twice what the Government are spending on the R&D base in this country. We are more than footing our share of the bill.

Lord Peston: That is right.

Professor Ric Parker: We certainly do not have any more to put into the pot and, frankly, we have choices about where within Europe we do that research. If we were not going to do it in the UK, we might do it in Germany.

Professor Sir Robert Lechler: I have a couple of supplementary points. The first one is to reinforce what Alex said. EU funding is a big part of our portfolio of funding. In the Russell group, about 13% of our research spend comes from the EU, so it is a very significant fraction. I would highlight two distinctive things about EU funding as opposed to any other funding. The first, as I said earlier, is that framework schemes have catalysed collaboration, because for the framework funding you need to have multiple countries participating in a bid in order to get the funding. One might say that sometimes that was slightly overengineered, but it certainly fostered collaboration.

The second scheme that has been distinctive is the Innovative Medicines Initiative, which is quite a substantial budget, and to win that kind of money you had to have a partnership between an academic institution and industry. The UK has been number one in receiving that money and, again, it has been catalytic in fostering industry/academic partnerships. Those are two particular bits of vitality.

Q32 The Chairman: I will follow up Lord Peston's question to Professor Parker about business spend on research, particularly in the European context. In its written evidence to us, the Royal Academy of Engineering pointed out that the UK has the lowest success rate for business applicants for funding from Europe¹, and it felt that United Kingdom businesses—not SMEs, but larger businesses—are not adequately supported when they apply for European Union research and innovation funding. Would you like to elaborate as to how you think business should be more adequately supported?

Professor Ric Parker: Yes, the proportion of European money that goes to business in the UK is low compared to many others, but the absolute amount of money is second only to France and Germany, so, again, we have to be careful to talk percentages or talk amounts. Regarding the money that flows directly to British business out of the framework programmes, we are tucked in behind France and Germany. In the UK the difference is we are much better at engaging our SME community. Our small to medium-sized enterprises are quite good and effective at getting at European funding. I do worry, for reasons I will come back to, that that may not continue. As I said, only two large companies in the UK, Rolls-Royce and one other, are in the top 50 recipients in Europe. That is well below our batting average or where it should be if we were pulling our weight. I am not sure why that is the case for UK companies, but one of the changes in the support mechanisms in the last five or so years is the removal of the RDAs. The RDAs, through their innovation funds and their innovation boards, did a lot to stimulate engagement in Europe from the business community. The LEPs that have replaced them no longer have that prime objective and the funding to achieve that, so we are seeing less stimulation of UK industry to engage in the European programmes, which is regrettable.

Lord Hennessy of Nympsfield: When Lord Wilson, as Prime Minister in 1967, was preparing the Labour Party's second application to join the then EEC, he stressed endlessly that what we really could bring to the Community was science and technology as part of our special gifts and accomplishments. Did it turn out that way?

Professor Ric Parker: Yes. We are major participants in collaborative programmes. If you look at European Research Council funding across all three grant types, 20% of all grants

¹ compared to France and Germany, with the UK ranking 7th out of all 28 members states, Royal Academy of Engineering written evidence,

come to the UK. In that we are major participants and in that these are collaborative programmes, we are educating and leading the rest of Europe in many of these areas, and bringing our thought leadership and, in our case, our industrial leadership to Europe, so I think it could be said to be true.

Q33 Lord Fox: I should declare my interests at this point as it is the first time I have spoken. I am employed by and have a financial interest in GKN plc, which is a participant in EU funding programmes, including the Clean Sky programme. You mentioned that some countries seem to support businesses better in their endeavours to get this money. Which countries would you highlight and what particularly about what they do is better?

Professor Ric Parker: I think the German system works particularly well. There is an infrastructure at the Länder level. It is largely down to granularity, particularly with smaller companies. We expect them all to come to London to get advice and help and that is not going to happen. When we had the RDAs, they could go to their local regional development agency and get that help and support, particularly if it was the first time they had ever submitted a grant proposal. The other support they need is finding those partnerships across Europe if they do not know their way around. There is a lot that can be done to help. It is part of the formal remit of Innovate UK, if you look at their charter, to help in this way. Again, that is very London-centric and tends to be a website people can go to and it really needs to spill out into the regions a bit more.

Lord Fox: You are not finding that the LEPs are stepping into that role?

Professor Ric Parker: The LEPs are at the wrong granularity. They are too small. They have no consistent blueprint. Some of them do quite a good job of this; others do not. There is no instruction that they must all operate in this way. It is largely down to each individual LEP and how it chooses to engage, and they do not, by and large, have the funding to participate in this sort of activity in the way the RDAs did.

Lord Hunt of Chesterton: Is your response back to the response on question one? On the continent of Europe, you could say the concept of Europe—the political, economic and technical aspects—is very much done at a regional level. Indeed, it is the people in the regions in Europe who understand why they are in Europe and what it is about, whereas, when it is very London-centric, we miss out on this. My question to the academics is: who are you talking to when you are trying to explain Europe and science? Surely the answer is it must be through the regions and the regional elements of the UK, because in those areas people identify industry and technology. I just wonder whether that is possibly part of the way of outreaching your debate. Have you thought about that?

Professor Alex Halliday: I think it is something we can do. As I say, the Royal Society's job is to provide the data and facilitate the debate rather than to actually say what we should do. Communicating with the regions is something we are doing increasingly and holding meetings around the regions of the UK about a variety of things. At various stages, the president of the Royal Society has led that activity and it is something we should definitely consider doing more of. Of course, the universities are also involved increasingly with the LEPs and the local regions, councils and businesses. The universities have engaged increasingly, particularly in places such as Manchester, in seeing how the region develops and helping to inform discussion. There is a lot of feed-through that comes to the higher education sector as well.

Q34 Lord Cameron of Dillington: Does our membership of the EU influence R&D investment by outside businesses into our research and development programmes? Does our EU membership, both in the investment we get from the EU and indeed collaboration, encourage international investment? What would happen if we were an associate country, such as Norway or Switzerland, would we attract similar amounts of money? For that matter, in the case of a Brexit, would we create new international partnerships with the US or the Commonwealth or China? Would we be equally successful in attracting international funding from businesses? How do you see the international business research funding being affected?

Professor Sir Robert Lechler: Shall I start on that because I have already made reference to it in regard to life sciences and the pharmaceutical biotechnology industry and so on? I quoted to you some observations made by the BIA, and the Association of the British Pharmaceutical Industry has made similar observations. They would say that harmonisation of the market and regulation has been a factor in why some major pharmaceutical companies have chosen to put their European headquarters in the UK, along with the UK's research performance of course. It is difficult to answer the question of if we were an affiliate as opposed to a member, because there are a lot of unknowns there. My observation would simply be that there is greater security of our position and our influence, and so on, on regulation harmonisation and all the things that are relevant to industry partnerships that come from our membership. If we withdrew and became an affiliate, then we are moving into slightly unknown territory, although of course there are case studies, as you said, from Switzerland and Norway. The Switzerland case, as I am sure you are all aware, has been a volatile relationship.

Professor Ric Parker: Regarding overall inward investment in the UK by industry, it is quite obvious that many companies have established themselves very successfully here. You only have to look at our car industry. There is little, if any, UK-owned car industry any more, but most of the car industry we have here is not here to address the UK domestic market, it is here because from the UK it has a springboard into Europe that would be denied otherwise. Toyota, particularly in my own home town of Derby, is our second biggest employer now, after Rolls-Royce. We have attracted companies because being in the UK gives them access to Europe. Other companies, such as Sharp, have brought their research bases to the UK. Again, that is stimulated by that access to Europe.

If we look at other collaborations, one of the strengths of Europe is this framework. It is called a framework for the good reason that it has a consistent set of rules and objectives. Sometimes the rules are a little complicated, but they are there, and it allows collaboration relatively easily across European institutions and between industries in one country and another country. When it comes to Anglo-American collaborations, in my experience it is quite difficult because we have totally different schemes and totally different attitudes to what the Americans call "corporate welfare", and that makes the alignment of any collaborative programmes very difficult indeed.

Professor Alex Halliday: The biomedical industry in particular is concerned about this, partly because the UK is only 3% of the global market whereas Europe gives you the largest single global market you have, so they see the scale-up opportunities as being particularly important. The other thing the European Union has facilitated is not just regulation, but also funding to actually catalyse work with industry and business in the biomedical area. There is an important instrument called the Innovative Medicines Initiative mentioned by Robert.

This is a public/private partnership, which works with the pharmaceutical companies across countries, and Robert is of course more of the expert in this than I am. It involves a number of universities in the UK that have been immensely successful at being part of this. It is part of a European-wide effort at a time when drug discovery is desperately in need of collaboration, more working together and less competition. It is immensely important globally as well as being important for Europe and the UK.

Professor Sir Robert Lechler: I referred to Switzerland. When Switzerland fell foul of migration regulations before they readjusted them, they lost their IMI funding as a consequence.

Q35 The Chairman: Sir Robert, you referred to the life sciences, and our previous report was on genetically modified insects. The evidence that we had almost universally, not least from the Minister George Freeman, was that the climate in Europe was not conducive to investment in Europe by international companies. The interference from politicians and lack of inclination to follow the evidence base made this a rather hostile climate, if you had to choose between Europe and other countries. Indeed, in the case of GM crops, there might well be evidence that investment has gone elsewhere because of the lack of application of this technology. Would you like to comment, therefore, as to whether this aspect of Europe is conducive to inward investment in the life sciences?

Professor Alex Halliday: The story of GM has been a tragedy for UK science in many respects, particularly for the plant sciences departments in the UK that were very strong at one stage. I think that debate and discussion needs to be kept going and we need to make sure that the debate is informed by proper robust scientific evidence. That is hugely important across Europe, and if we want to change Europe we think we can help do it. We think we can influence things certainly through the academies. Even though there is massive political baggage associated with the issue, as a society, we believe we can influence the other academies and actually get them on board.

The Chairman: If I could press you a bit on this, do you think that the European Union, or perhaps, to be more specific, the European Parliament, if not the Commission, has led to a lack of inward investment in this area that we might otherwise have been able to attract?

Professor Alex Halliday: I honestly do not know the answer to that, to be fair, but I would say that I see it as a landscape in which we have to engage for the future and we have to change it. It is not going to do us any harm. If anything, it is going to improve our chances of success in this area if we can actually build up GM technologies in the UK, in partnership with other parts of Europe. That is something we are very keen to do. The Royal Society produced a booklet on questions about climate change, which seems to have been quite successful in communicating to people the main issues so that the public understands the issues and the questions. We are currently doing one on GM, which we hope will have the same successful outcome.

Professor Sir Robert Lechler: It is a mixed picture, but I would like to highlight three areas where the UK in particular and the academies have been influential in a more conducive legislative framework. One is around access to data for epidemiological and large genetic studies, which are increasingly important. Again, that has had a wobbly course, but recently there has been a more conducive set of legislative decisions, which has been very helpful. The second one is the clinical trials directive. Again, the most recent clinical trials directive

has been welcomed, and I think it is very relevant to the issue that Alex referred to on the size of the patient populations that pharmaceutical companies are interested in, so that is a positive. The third is the use of animals in research. Again, it has had a chequered history, but most recently the decisions have been rather favourable. I think that all those are indications of the influence that we both have had and would wish to have and that is necessary if we want to make use of our participation in Europe for large-scale research.

Q36 Baroness Neville-Jones: Do you think against that background and history that you need to be more active in the future in the whole area of spreading the understanding of science?

Professor Sir Robert Lechler: I am not sure if I am very well placed to answer that as I am the new boy in this business. All I can say is certainly the Academy of Medical Sciences, and I am sure my colleague academies, is very closely involved with the associations of European academies. My early impression is that works rather well. Whether we should be more involved, maybe. I am not sure.

Baroness Neville-Jones: A lot of these areas of modern science are going to get more and more into the way people live their lives and what they believe, so they become of sociopolitical importance. Does that not indicate a very active role?

Professor Alex Halliday: I fully agree. I think to some extent we should have been doing more in this area in the past. Part of the problem is the European academies are somewhat mixed. They probably think the British ones are too. We have started focusing on certain key collaborations. There are two the Royal Society engages with, which are: the European Academies Science Advisory Council, which does some good work; and ALLEA, the All European Academies. We work with those to discuss how to take forward some of these issues on the European stage. We are thinking increasingly about this and being asked to come forward with suggestions of things that should be discussed within Europe. We are also forming stronger alliances than previously with some of the top academies, such as the German Leopoldina. Many years ago there were three main Germany academies so you did not know which to engage with. Now the German Government have recognised that they need one particular German academy to represent the country, and the Leopoldina has become that. It has considerable funding and is doing considerable interesting work, and we should be working with it closely. The French Academy is also doing some wonderfully exciting new things. We are also in constant discussion with other academies about things that we could do with them. Developing a communication platform for working across Europe is important. It is good anyway, because science is global, and we need to be thinking about how to address issues with global consensus, but it is particularly important for this issue of societal engagement and influencing policy.

Q37 Lord Hennessy of Nympsfield: Can I ask for your thoughts about the different way in which scientific advice is organised in the UK compared to the EU, and, specifically, the overwhelming need, as we all see it, I am sure, if evidence-based policy is to have any chance at all, for officials, chief scientists and everybody else speaking truth unto power? Could you talk specifically about the new scientific advice mechanism which the EU is proposing? Do you think it needs a chair who will be proactive in all this? Do you think it should have the power to go into areas where the Commission might not invite it to go into? From a British

perspective, it strikes us as a pretty neutered outfit compared to the one we are used to here, particularly on the speaking truth unto power point.

Professor Alex Halliday: Many people in the UK feel that the system of chief scientific advisers that has been developed in the UK, and which was expanded under Sir John Beddington in particular, has worked extremely well, and I think there is some level of dismay that it has not worked as well in trying to make things happen with Europe. The Royal Society has been quite vocal on Europe's need to get strong scientific advice feeding into government at the European scale. The Commission has actually been quite responsive to that need. The scientific advice mechanism that has been put in place does offer some strategic advantages for the UK. Apart from anything else, we have Julia Slingo sitting on it as one of the seven members of the Committee. I think the question is really how the national academies are going to feed into this, and at the moment that is very unclear. It is being put together and it is a sort of "watch this space" scenario where we are trying to have a strong influence. There is a certain sense that of course the UK is highly regarded. There is also a certain sense—and I do not want to sound as if people in Europe might be irritated with the UK—

Lord Hunt of Chesterton: Heaven forbid.

Professor Alex Halliday: —that can play into this space as well because we have a sense that, "Oh, we know how to give scientific advice". I think we have to be quite careful about how we evolve that mechanism, and to be diplomatic and helpful rather than too confrontational.

Professor Sir Robert Lechler: It is early days for the scientific advice mechanism. I think the jury is out. My understanding is that they intend to elect a chair from within the seven senior members but, as Alex said, the academies would wish to have a route in that will be influential. Time will tell.

Professor Ric Parker: Europe has tried it one way. They had Dame Anne Glover advising Barroso; more or less a lone voice and very undersupported. She was on a hiding to nothing there, but did an excellent job despite that. To go to this scientific advice mechanism, the academies will have a role in both selecting the advisers and advising the advisers. It is that structure we are all trying to put in place at the moment and work out how it will work. The fundamental difference in Europe compared to the way the UK system works is this great need for consensus. In the UK, scientific advisers are willing to give advice whether it is in line with consensus views or not, and that is a jolly good thing.

Back to your point about whether the advisers should be proactive in advising on areas where they have not been asked questions, yes, we would certainly endorse that, and they should have some freedom to make their own research into certain areas and give advice even before it is asked for.

Professor Alex Halliday: I want to try and clarify one issue of potential ambiguity. The High-Level Group is tasked with the job of choosing a chair every year and that is supposed to rotate, so there is a sort of chair de facto built into the system already.

Lord Hunt of Chesterton: I would have said one of the differences is that in the UK we have a very strong Civil Service and Executive. These advisers talk to the civil servants and to Ministers, and very occasionally to parliamentarians. You should hear what they really say. It is completely different on the continent, where these substantial changes in regulations on

drugs and all sorts of other things have been decided by parliamentarians. That is why it is a totally different position. It will require a scientific body to work in this continental way where parliamentarians have power as opposed to this area, where it is a secret cabal of civil servants and Ministers a lot of the time. I wonder whether this point needs to be explained.

Professor Ric Parker: I think you need both those channels of advice. You need advice to the Commission and the parliamentarians. The Parliament has its own science and technology committee and can seek advice itself. In an ideal world the same panel, the same mechanism, would be able to provide consistent advice to both. Our own MEPs in the UK are very welcome to be advised by the learned academies in the UK should they seek our help.

Lord Hunt of Chesterton: That is important.

Q38 Lord Vallance of Tummel: Can we take a closer look at the regulatory set-up? Is the balance of power between what is done at European Union level and what is done at national UK level about right, or are there areas where some rebalancing might take place? Have you any examples of where the EU regulatory framework works particularly well?

Professor Ric Parker: One area where the framework works especially well is in setting standards across Europe which we can jointly agree and that are then mandatory across Europe for many areas of industrial engineering work and other facilities. Having that common set of standards across Europe and having a common framework is an area where the legislation works well. There are other areas where you need joint legislation. The REACH legislation for chemical hazards is one, which again needs to be done on a European-wide basis, but the way it is implemented can be to the detriment of the competitiveness of some UK companies in that they suddenly find they have to do a lot of work to find alternatives for products, with little help from the European Commission. The Commission needs to devote some of its research funds to helping us find these alternatives to some of the products that are now on the proscribed list. I would not like to comment on the overall balance. All I would say from my observations is the UK needs to be more on the front foot and getting involved in setting and defining European legislation rather than it being something that is done to us, which is often what it feels like.

Lord Vallance of Tummel: Would either of your colleagues like to comment on the overall balance? Are there any areas where you think things should be tipped more towards the nation state than they are at the moment?

Professor Alex Halliday: From my perspective—and I am sure Robert will have views on this as well—there are a number of areas where we have to be careful to make sure, while we believe in the importance of European regulation, that things that are introduced do not stop us from being able to do frontier research. Of course, there have been some very important areas that are affected by that. Data regulation is an important part of this, and we are pleased to say that in December the research side was brought back in as exempt regarding the use of personal data—and I will not go into what “personal” means—so there is a recognition that what we need to do as regards research can still be conducted. It is very important for biomedical research in particular.

The other significant area I would highlight, before passing over to Robert, is copyright reform, which has been a fairly major issue for academics who publish lots and lots of material. In America and Britain, you can do data and text mining, but in Europe they are moving against that, so we are having to work quite closely with the publishing companies to

explore how that gets dealt with on a European scale. Again, things are looking fairly positive, but at the moment we are still in a position where there is an issue to sort out.

Professor Sir Robert Lechler: I mentioned three areas where I thought there had been positive progress and benefit from our engagement. I talked about the use of data, to which Alex has just referred, clinical trials regulation and the use of animals. In principle, maybe one can draw a distinction here between research that by its very nature involves access to large populations and datasets, in which case it is necessary that we have harmonised regulation, because it allows access to large datasets. Then there is research that does not. A couple of years ago the academy produced an influential report on the use of animals containing human material. I think that is something we have defined rather well in the UK. I do not see the need necessarily for the same rules to apply across continental Europe and the UK. It is on a case-by-case basis. Increasingly, as we think about things at the population scale, the balance is about right, and I think our influence is palpable and detectable.

Baroness Neville-Jones: The Chairman says that I must be very brief with this question, so if the answer is no just say “no” without feeling the need to elaborate. In the scientific community, do you find that you are affected by any of the decisions of the European Court?

Professor Alex Halliday: I do not know.

Baroness Neville-Jones: The safe haven is the one I am thinking of that affects data transmission. The answer is no, it would appear.

Professor Ric Parker: I am not aware.

Professor Sir Robert Lechler: I think no.

Q39 Baroness Manningham-Buller: I think you have answered most of the question I was going to put to you. All of you have emphasised the importance of mobility of people in Europe and what advantage this has for British science in attracting students, academics and so on into the UK. I am going to focus in on the question of whether this freedom of movement has any deterrent effect on people from outside the EU coming also to join the labs and research bases that we have and of which we are so proud and which have been so successful.

Professor Ric Parker: I do not think mobility within Europe is a deterrent. Our own immigration laws are a significant deterrent and are causing major problems at the moment. We need to look again at that.

Baroness Manningham-Buller: Which this Committee has looked at.

Professor Ric Parker: It would be a particular worry if in the future, if we were not in Europe, those same immigration laws prevented this free flow of people in Europe. It is particularly difficult for companies such as my own, which operate across multiple sites within Europe, where the ability to move our own employees around freely and develop them through different parts of our business is particularly important. Again, if I go back to the figures I gave on engineering doctorates, 47% of all the engineering doctorates in the UK are gained by people from outside the EU and the UK, so we are very dependent on those people coming here. Unfortunately, we do not welcome them to stay on and use those skills and knowledge in the country. We tend to send them back straight afterwards, which is rather regrettable.

Lord Peston: Can I ask one very brief question? Optimality requires equal treatment of equals, and therefore the people doing the recruiting should be able to hire the person they really want. Given that there is free movement from the EU here, but not free movement from, say, India or China, surely that must lead to suboptimality, on any piece of economic analysis?

Professor Alex Halliday: From the point of view of recruiting scientists, it is not a huge problem. To go back to the visa issue, I think the Home Office has been quite responsive in understanding what HEIs need. HEIs sometimes need to understand better what the Home Office can help us with. The fact is that we compete globally within the UK and on a European basis. We benefit from having more EU post-docs coming here as Marie Skłodowska-Curie fellows, for example. I think it is 23% of Marie Skłodowska-Curie fellows choosing to come to the UK, which is a phenomenal success. We are getting all those people here and it is building up the science, it is creating hubs of excellence and a buzz scientifically, and the net result of that is people from around the world want to come to the UK. I do not think it has anything in the way of detrimental effect. It has, if anything, a very positive feedback on what is happening.

Professor Sir Robert Lechler: There are two specifics possibly worth mentioning. One is that if you compare continental Europe with the US as a pool to recruit from—and I am sure we have all been engaged with lots of international recruitment—you get into salary issues more commonly with recruiting from the US than you do from continental Europe. For the clinician scientist cohort in particular, the EU is a big advantage, because getting recognition of equivalence of training for clinicians is much easier in the EU than it is if you are recruiting from outside the EU, so people can get a job both as a clinician and as a scientist.

Q40 The Chairman: At the risk of encroaching on the next session, and I apologise in advance to them, there is one issue I would like to come back to, Professor Parker. You touched on the absolutely critical issue of inward investment in this country. You referred to the great success of the car manufacturing sector, which has indeed been a great success story. You said that this was because it gave multinational companies the ability to have access to Europe. Is access to Europe in this context dependent on EU membership? I seem to have read recently for example that Toyota has announced that if Brexit happens it has no intention of disinvestment in this country.

Professor Ric Parker: I would not like to comment on Toyota's own statements. It has other plants in Poland, for instance, that it has built up substantially, so it has other choices for future investment. I am sure it would not disinvest. It values the domestic market in the UK and there are lots of Toyota cars on the road, as we all see. It is a question of anything that puts additional barriers in the way. We have seen in the past some of the national practices within Europe, when it comes to imports from outside the EU, that are probably not as open-minded as the UK to some of these things.

The Chairman: Thank you very much. We have run out of time. I am most grateful to our three witnesses for appearing today. We will, of course, be circulating a transcript of today's evidence. Please make any minor corrections that you think are appropriate, and, if there is any further supplementary evidence you would like to submit, please feel free to do that. Thank you very much.