



HOUSE OF LORDS

Revised transcript of evidence taken before

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**

Evidence Session No. 1

Heard in Public

Questions 1 - 8

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10.35 am

Witnesses: Professor Steve Cowley, Professor Kurt Deketelaere
and Professor Dame Janet Thornton

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 Hennessy of Nympsfield
Lord Hunt of Chesterton
Lord Kakkar
Baroness Manningham-Buller
Lord Maxton
Baroness Morgan of Huyton
Baroness Neville-Jones
Lord Peston
Viscount Ridley
Lord Vallance of Tummel

Examination of Witnesses

Professor Steve Cowley, Chief Executive Officer, UK Atomic Energy Authority and Head of the EURATOM/Culham Centre for Fusion Energy (CCCFE) Fusion Association, **Professor Kurt Deketelaere**, Secretary-General, League of European Research Universities (LERU), and **Professor Dame Janet Thornton**, Director Emeritus of EMBL-EBI and Senior Scientist, European Bioinformatics Institute (EMBL-EBI)

Q1 The Chairman: Could I welcome the three experts who have come to help us with our deliberations today? This is the first of what will be several oral evidence sessions. We are most grateful to you for helping us. Would you like to introduce yourselves for the record? We are being broadcast. If you would like to make any opening statement, please feel free to do so. Can we start with Professor Cowley?

Professor Steve Cowley: I am Professor Steven Cowley. I am the chief executive of the United Kingdom Atomic Energy Authority and I run Culham laboratory, which houses JET, the largest EU-funded facility on British soil.

The Chairman: We are very glad to see you again. I remember you gave evidence to us in July. Dame Janet?

Professor Dame Janet Thornton: I am Janet Thornton. I have worked in UK academia for 30 years, and then I moved to become director of the European Bioinformatics Institute, which is part of the European Molecular Biology Laboratory or EMBL. I will explain why I think it is relevant that I am here. It is a European organisation funded by 21 member states. It was not established and is not governed by the EU. In fact, although we receive about 25% of our funding through competitive grants, our core funding comes from our 21 member states 5 also receive a lot of funding—about €6 million in the UK this year—from the EU. In addition, over the last seven years I have co-ordinated the establishment of ELIXIR, which is the biodata infrastructure for Europe. That now involves 15 countries and is concerned with sharing biodata and bioinformatics tools across Europe. It is one of the infrastructures of the European Strategy Forum on Research Infrastructures (ESFRI).

The Chairman: You explained that you are a European rather than a European Union organisation.

Professor Dame Janet Thornton: That is right.

The Chairman: And you have associate members as well as the 21 full members.

Professor Dame Janet Thornton: We have two associate members, Australia and Argentina. This is rather a new venture for EMBL. Of course, science is global, as you will be well aware, and certain countries like to associate with EMBL because of its infrastructure, the way it operates and performs world-class science, and because the countries like to learn how to operate an international infrastructure.

The Chairman: We will come back to that perhaps in the questioning. I can see already that Lord Ridley is keen to ask about that. We will move on with the introductions. Professor Deketelaere?

Professor Kurt Deketelaere: My name is Kurt Deketelaere. I am a professor of European energy and environmental law at the University of Leuven in Belgium, but I am here today primarily in my other capacity as secretary-general of the League of European Research Universities, LERU. I will say a few words on LERU because I do not think you are all familiar with it. We are a group of 21 research-intensive universities spread over Europe. We are active in nine EU member states and Switzerland. We absolutely do not have the ambition to have members in every country of the EU, because, obviously, that would be a problem for the level of excellence that we demand of the membership, so, as a consequence of that, we are only active in nine member states and Switzerland. We are not funded by anybody else other than our own members. We refuse to receive any kind of funding whatsoever from the EU or the member states, because of course we want to stay independent and neutral.

Our main goal is to promote the interests of frontier research on a daily basis at the EU institutions, be it in Brussels, in Strasbourg, in Budapest or in other places where EU institutions are based. At the same time, we try to do the same thing at member-state level, because we see more and more that convincing national authorities, and in the first place Ministers of Finance, is an important element in the daily battle to defend frontier research. Next to that, LERU is also the main engine behind what is called the Global Council of Research-Intensive University Networks. That means that LERU has been teaming up with similar networks of universities worldwide, be it, for example, the Association of American Universities in the United States, the Group of Eight in Australia or the Russell Group here in the UK. It is clear, of course, that on an issue such as this, and on many other issues, we are in close contact with the Russell Group in defending all kinds of positions where we clearly have similar interests. Obviously for an issue such as the one we have on the table today we also have close links with Universities UK and, if it comes down to figures, data and facts, it is clear that we would be happy to refer to the input into this inquiry by Universities UK, by the Russell Group and organisations such as the Royal Society.

Q2 The Chairman: As this is our first session, before I ask the first question I must declare my interests as a fellow of the Royal Society, a fellow of the Royal Society of Biology, and chairman of the Foundation for Science and Technology. You will recognise that our inquiry is about the relationship between EU membership and the effectiveness of science research and innovation in the United Kingdom. The questions today will be very much about the impact on UK research and innovation. Could I therefore ask a rather general question? To

what extent is EU funding important to the UK science base? Does it contribute to vitality and productivity? Is it something that we should value?

Professor Steve Cowley: My career started in the United States where I went to do a PhD in the early 1980s. The US was very much on top of big science at that time and had great facilities. The funding in the US for big science was the envy of the world. In the years since the early 1980s, Europe has become the world leader in big science. More and more science is progressing towards big science. For example, if you look at the average number of authors on a paper, it is increasing with time. It is increasing because science is often done in large groups, in large collaborations—that is the way you get effective science. It requires large instruments, instruments in the billion dollar class—sorry, I should use euros. What has happened since the 1980s is that the infrastructures and the organisation in Europe have exceeded those of the US, and many of the great scientific instruments of our time, of the 21st century, are now in Europe. I cannot say that happened because of a particular political infrastructure, but the fact is it happened, and the advantage we now have, with access to the world's greatest scientific instruments, translates necessarily in the long run into greater growth, more jobs and greater innovation.

The Chairman: Could I come back to Professor Cowley before I ask Dame Janet whether she would like to add to that? In the evidence that you gave us earlier you explained how the nuclear fusion programme, by its very nature, has to be collaborative. The scale of expenditure and the scale of the research make it quite inconceivable that individual countries should try to play a significant role, although I think China is trying to do that as a lone operator. There is, of course, a programme in the United States—the National Ignition Facility—which has a rather different basis, and presumably it might have been possible, at one stage in our history, for us to have collaborated with America rather than Europe, if we were going to collaborate. Presumably, having gone so far with JET, and now ITER, it would be quite impracticable to change horses if we decided that the United States' facility was the one that was going to be the winner.

Professor Steve Cowley: At this point, the world's record fusion performance is at JET, on British soil. We have the greatest fusion capability in the world. That capability is supported largely by European money. I cannot answer the "what if" question as in "what would have happened if we had done this in the past." All I can say is the empirical fact is that we are world leading.

The Chairman: What I am saying is that whoever is going to be the winner—and presumably there will be a winner one day, and we are world leaders, as you say—we are committed to the European one, which you say was the right decision, but, equally, there could have been a decision historically to have collaborated with America, but we did not take it.

Professor Steve Cowley: At the moment, of course, we are having the Americans coming to collaborate with us. They are coming to JET because we have the best facility. That still gives us the prime place. On the "what if" question, if we had done something in the past, at the moment we would not be in the lead. That is all I can say.

The Chairman: Dame Janet, did you want to add anything?

Professor Dame Janet Thornton: Yes, very much so. My experiences are rather similar to Professor Cowley's. I have always worked in the UK, which is different, but certainly when I started all my collaborations were with the US, and that was where I looked to for

inspiration from the leading science and to form interactions. My very strong belief is that that has changed because of EU funding. As you will know, the EU funding that we receive for science is a very small fraction of science funding in the UK, at only about 3%. However, the impact that it has, in my opinion, is way more than that money would suggest, for a variety of reasons. It enables and encourages us to collaborate within Europe. I think that is very important. We are part of Europe, it is close, and, for many people in the UK, it is easier to go to the continent than it is to go up to Scotland, so we are natural geographical collaborators. It allows us a much stronger voice as part of the EU in the funding that we get. The UK leads in certain areas, and genomics is one of them. I would endorse strongly the mixed funding economy. The position of the UK in genomics came mainly through Wellcome Trust funding. However, with collaborations across Europe, I think we can look towards implementing it in genomic medicine. We cannot do that on our own, because it needs data for millions of people from across the world. We have the strength in Europe and the population, obviously, although whether the data in the health services are well organised remains to be seen. There is no doubt that the leaders of this are in Europe, and the US is now copying us in what we are trying to do.

Another reason why the UK benefits from European funding is that we speak English and, because we are excellent at science, we recruit many, many brilliant scientists from Europe to come and work in the UK, who want to learn English and be fluent in it, and they come, usually with either Marie Curie or postdoctoral funding, at their most creative time. That input of talent from Europe—and of course the UK is the second most successful country in getting competitive funding from the EU for research—has meant that the UK has been extremely successful in raising those funds from the ERC. I sit on the ERC Scientific Council and it is very clear that the UK has been very successful in winning those funds. These are the brightest and the best of the young science minds in Europe, and there is no doubt in my mind that the UK benefits disproportionately from recruiting those brilliant people.

Professor Kurt Deketelaere: I would add a few elements to that. As Dame Janet has indicated, if you look at the facts and the figures, it is clear that the UK is absolutely at the top of funding from the framework programmes of the EU, both from the seventh framework programme, which has ended, and from the new framework programme, Horizon 2020, which is in its third year of development. It is clear that the UK is in the lead. If you look at the figures from the ERC, as Dame Janet just mentioned, it is clear that the UK is the most successful country in winning ERC grants, be it starting grants or advanced grants, and things such as that. We have come to a position where EU funding has become what I would call an irreplaceable and increasingly important source of funding for UK research and innovation. Some authors describe the European funding as a kind of eighth research council next to the seven that you have in the UK.

I know that very often in the past the argument has been made that the red tape which EU funding involves is way too much, and people are not interested in applying for EU funding because of it. With all modesty, I would say that through the lobbying that the Russell Group, Universities UK, LERU and other organisations have been doing over the past few years, certainly as regards Horizon 2020, this is no longer an argument to not participate in the framework programme. The red tape has been cut down very significantly and it is an ongoing process. It is clear the EU has made enormous progress over there, primarily through the lobbying and influence of organisations such as the Russell Group, Universities UK, LERU, and so on. It is important to be around the table, to be able to say what the

problems are and what the solutions should be. Simplification, excellence and investment in research and innovation are going to become much more difficult if you are no longer around the table and no longer have a voice. Obviously, money is an important element in this whole discussion, but I would say that even the intangible elements and the fact, as was already said, that you have access through the EU—which is acting as a kind of vehicle, as a platform, having access to the best people, be it researchers or students, and to the best research infrastructures—to this funding and to collaborative projects have been very beneficial for the UK and, obviously, the rest of the EU has also benefited from UK involvement. It is clear that it is working in two ways.

Lord Maxton: Very briefly to Professor Cowley, because he said that there has been this change from the United States to Europe: is this down to a decline in US funding and the whole big science thing, or is it down to the fact that Europe has become more important?

Professor Steve Cowley: I do not think it is due to a decline in US funding. You can see that the US has commented on this. I used to write reports for the National Academy of Sciences in the States, and in those reports one of the things we pointed out was that as the scientific instruments get larger, the system of funding in the States, where the states compete for it, becomes more and more difficult to handle. The US should have one particle physics lab, but in fact it has five. In Europe, we have made those decisions rather well. It is impressive the way we have come together and coalesced on a series of large instruments that are world-leading. I think that is rather impressive as a political process.

Viscount Ridley: I have a point of clarification. Dame Janet, you said that there were 21 full members, plus Argentina and Australia as associate members. Are all 21 members members of the European Union?

Professor Dame Janet Thornton: No. Let me give an example.

Viscount Ridley: Switzerland and Norway, for example?

Professor Dame Janet Thornton: Switzerland and Norway are members. EMBL is separate from the EU.

Viscount Ridley: I realise that.

Professor Dame Janet Thornton: We are not run by the EU and, if we came out of the EU, the UK would still be part of EMBL.

Viscount Ridley: So is it right that all three institutions that you three represent have full non-EU members?

Professor Dame Janet Thornton: Yes.

Viscount Ridley: Because you have Switzerland and you have America.

Professor Dame Janet Thornton: Yes, that is right.

Viscount Ridley: And others presumably.

Professor Steve Cowley: We do not have America as a member, but we have Switzerland.

Lord Hennessy of Nympsfield: Could I follow up the red-tape question? A great weight of the written evidence suggests that the British research councils are much more nimble even still, despite the changes you have been describing, than the European one, which is very encouraging. I was thinking the other day that it would be nice, if we stay in, to come up

with something constructive in Europe instead of the usual drizzle of complaint, which has been the British stance in Europe. The shock value would be immense. Is this an area that we might develop so we can strike down the remaining chains that are holding back the European Research Council and all its associated bodies as a bit of a British initiative?

Professor Dame Janet Thornton: If I may comment, I think that the setting up of the European Research Council, which funds individuals to do excellent research, was driven in part by the UK as well as a few other nations, and that has been a tremendous success. However one of the reasons for the complexity of EU funding is that it supports collaborations between existing projects funded by the member states. EU funding is only 3% of the total research funding in the UK and most research in Europe is funded by the nation states. These EU grants serve to form the collaborative umbrella that joins together that nation state funding. When you are organising large projects, it is inevitably more complex than is the case for most of the UK grants that go through RCUK. I agree completely that RCUK is brilliant. Because of ELIXIR, I have visited many European countries. In comparison our research councils are excellent. The decision-making process in general is excellent, compared with many other countries, and we can really lead the way and bring Europe on. Many of the smaller countries are trying to learn and the UK can help in that. I think that we can have a positive effect. Certainly I would vote for smaller projects being funded by the EU that were more directed. I think that would have a big impact in Europe.

Lord Peston: I would like to ask a question of Professor Cowley, and I speak, as he is, as a Princeton alumnus. He was talking about big science. By implication, is there also a subject called small science?

Professor Steve Cowley: Yes.

Lord Peston: That does not require vast funding or anything like that, but it does still go on, does it not?

Professor Steve Cowley: Yes.

Lord Peston: So we must have a perspective here.

Professor Steve Cowley: Yes. I was trying to make the point that there is more and more big science. If you look at the average number of authors on a paper, it is an increasing function of time.

Lord Peston: The other day I saw a piece in some book saying that a recent paper had 1,000 authors. I found that amazing.

Professor Steve Cowley: I am sure they all did significant work.

Lord Peston: Maybe they simply put their names at the end, but that is by the way. What I am interested in is what the driver is here. Is it the equipment that is driving the whole system—namely, the funding is for the equipment, and, if you have the state-of-the-art equipment, then you attract the people—or is it the people who enable you to get the equipment? What is the causation?

Professor Steve Cowley: That is interesting. You say 1,000 people, but, in order to run that experiment all those 1,000 people have to do their jobs and their jobs are all high level. At CERN, the people who analyse the data, the people who run the detectors, et cetera, all appear on that paper because big science is not only about the money for the equipment; it is about the money for the set of skills necessary to take the data and process it to the point

at which it is useful. You see this in biology, too. The groups become larger because you need people who analyse and who have a certain set of skills, and some computer scientists and some electrical engineers. At Culham, to run JET, we have 350 engineers. They do not all get their names on the paper, but without them it would not work.

Q3 Lord Hunt of Chesterton: I am in a minority among British scientists, but I was involved in EU projects, and the so-called bureaucracy meant that the way the EU ran the research was much more effective, in my area, in evaluating what was done in a project. That is very poorly done in the UK; if someone publishes a paper, off you go. The EU system is considerably more considered. Are you not throwing the baby out with the bath water if you start becoming as slick as the Brits?

Professor Kurt Deketelaere: That is a good point. I would say if you look at EU funding you really have to make a distinction between the ERC grants, for example, where the administrative burden is certainly not more than that which you experience here in the UK, and is perhaps even less, I would say. For the collaborative projects, to which Dame Janet has also already referred, perhaps the administrative burden can be a bit bigger, but certainly the outcomes and the added value of those big collaborative projects justify that. You have to be aware of the fact that the most important change in EU-funded research over the past five years is probably this enormous drive towards simplification. For groups such as mine and the Russell Group, simplification was the first demand when we negotiated Horizon 2020. Money was the second most important element. Simplification, and making sure that our people do not have to spend months and months before they can introduce an application for funding, has been very successful, and there is a clear commitment from the European Commission in the following years to simplify further the whole process. As you correctly say, the whole evaluation programme and evaluation of outputs of research done is really top of the agenda.

Lord Hunt of Chesterton: What you have done in the EU is to encourage networks such as your one, EMBL, and so on. In my own experience, that has not been very forthcoming from the UK, and we are now trying to catch up, it seems to me. The EU has been tremendous and the Americans are quite envious of that, from my experience.

Professor Dame Janet Thornton: The Americans are now copying us. We introduced ELIXIR and they have introduced a similar programme in the last two years to try to mimic this collaboration across Europe.

Professor Kurt Deketelaere: It is clear that EU funding has always been aimed at two essential elements of fantastic research, and those are international collaboration and researcher mobility, combined with the overall element of excellence, of course. It is clear that if you lose that element of access to international collaboration and access to mobility of people, that would be a significant loss.

Q4 Baroness Manningham-Buller: I declare an interest as chair of the Wellcome Trust. Could I come back to the infrastructure point on which you have already said a certain amount? I am interested, as are others on the Committee, in the way we have run ahead of the Americans, which is partly due to pork-barrel politics and partly of course due to access to National Health Service data, which they do not have. Let us think across the range of EU infrastructure, whether it is CERN, whether it is EMA, whether it is Heidelberg or whatever; is access to that denied? I think the answer to that is no, but is access to any of those key

parts of the infrastructure denied to people who are not members of the EU? Are there any parts of infrastructure which are EU-specific and, if you are not a member of the EU, are the barriers to getting access, say at CERN, harder than if you are? There are two points there: is there no access at all; and, if you are allowed access, are the barriers higher, or are those barriers overcome by a recognition of the need for the data and the science and the global nature of science?

Professor Steve Cowley: I can tell you about my facility. We are a £60-million-a-year facility. We are negotiating with international partners for them to put cash into the facility to have access. We do not give them access unless they put something into the facility. At the moment, we are talking with China about it bringing in some microwave equipment, and that will be a few tens of millions of investment, for which it will get some access to the next set of fusion power shots. I think that is common, but I do not think there is a principle here.

Professor Kurt Deketelaere: The crucial element in this whole discussion is the question of preferential access or non-preferential access. It is clear that if you are part of the EU game you are with those which have preferential access. If you are not, then, obviously, with all those infrastructures, you enter into a situation of negotiation, just as you negotiate international treaties in fact, and then you will have to see first of all, as is indicated, how much cash you need to put on the table and to what extent this can lead to preferential access or not. As a consequence of that, it is clear that if you are an EU member state, you certainly have an advantage compared to a non-EU member state.

Professor Steve Cowley: Can I come back on that? Where the science gets closer to market, then access becomes harder and harder for people outside the EU. One of the reasons for trying to encourage collaborations in the EU is to make sure those innovations that the science produces come home and they do not go elsewhere in the world. With particle physics and CERN, the innovations from that research are not immediately apparent, but they are apparent when you are talking about research that is closer to the market. We have seen, particularly on pieces of technology, for instance, that the EU has told us it does not want any foreigners to have access to particular parts of its technology.

Baroness Manningham-Buller: Do you think those broad principles apply to the other pieces of infrastructure?

Professor Dame Janet Thornton: We have to distinguish between two things here. In science, as you all know, knowledge is our goal, if you like. Knowledge is usually freely available to everybody in the life sciences area. Within EMBL, our two associate member states, essentially, pay a third of what they would pay if they were full members, and for that they have access, which is equal access, but they are much further away, and so they do not actually use the facilities as much as the Europeans would.

As we all know, biomedical data are an evolving world. The story of the genome and genomic status is a fantastic one, in the sense of making it available for everyone. Health data are a different matter. It is not resolved yet how we are going to share all those data and whether we should share them only within Europe. What is clear to me is if we are trying as a country, the UK, to negotiate with Europe—and the Nordic countries and the Netherlands are very good in this area and their equivalent to NHS data are very well organised—we want to collaborate with them, because they have these data. Together we can increase the power of our own data. If we are going to try to collaborate with 21 European member states and negotiate how we do it with every one individually to share

biomedical data, that is going to take a long, long time to achieve. The European Union provides us with an umbrella where those discussions can take place—hopefully transparently—so that we can begin to develop the data exchange infrastructure. The technical standards are easy by comparison; it is the legal exchange of data that is complicated. We have access to the XFEL data in Germany, for which we pay, and we can send our scientists there. Clearly, that is cutting-edge. It cost billions and we would not have done it in the UK, but, because we are part of Europe, we can have access to it.

Q5 Lord Cameron of Dillington: We heard last week, or maybe the week before, that it was felt that European funding has increased greatly the collaboration of UK science generally and not only within the EU. How do collaborations differ with a scientist from an EU member state and, say, a scientist from the USA, or maybe a scientist from the UK and a scientist from Switzerland, which is outside the EU as such? Is there any difference at all between the sorts of collaboration you see?

Professor Dame Janet Thornton: To me, as a scientist, there is no difference. Scientists are scientists and it does not matter where they come from; they collaborate. The only difference is access to joint funding. Funding mechanisms drive science. I have seen it so many times, in many examples. Within Europe, collaborations usually start off informally. You will speak to somebody and say, “Oh that would be good. We could do this together and perhaps we can join forces on this”. Then you have the ability to apply for EU funding—and this is rather a crude term—to grease the wheels of the collaboration. Most of that science will be funded by the member states, in the UK, or in Germany, if it is with Germany, but having that collaboration makes a huge difference. As we have seen in ELIXIR, where the UK leads on biological and molecular data, having access to European funding is a great driver in bringing countries together.

Lord Cameron of Dillington: Does that apply to industrial collaboration as well?

Professor Dame Janet Thornton: The Innovative Medicines Initiative has helped with that. There are some bureaucratic issues that are being resolved as we are going forward. Of course, all the big international pharma companies operate across the world. There are very few mechanisms whereby one can raise funds to interact with, say, an American group. There is the Human Frontier Science Program, but almost nothing else. In fact, my collaborations with the US have always been funded by the US. EBI receives a lot of money from the US. It is our second biggest funder after the EU. It pays because it wants the access to the infrastructure that we provide.

Professor Kurt Deketelaere: In my view, the main difference is that if you work with somebody from an EU member state, there is across the board, for all 28 member states, a clear framework—legally, financially and content-wise—to work with people. If you look at the ERC or Marie Curie or Horizon 2020, all those initiatives are organised in a way that is applicable for everybody across the board. If somebody comes to my institution with an ERC grant, then I know the conditions under which this person is going to work. It is the same for a Marie Curie fellow. If you look at Horizon 2020, there is on the table, from the side of the European Commission, a model grant agreement which has to be used by everybody who is getting Horizon 2020 funding. The rules of the game are very clear for everybody involved in it. Obviously, if you go and work with people from other countries, other non-EU member countries or other funding sources, then each time you will have to regulate those things bilaterally, and this is going to become very burdensome at a certain point in time.

This model grant agreement makes it possible for the European Commission and the member states to be sure that the basic rules of the game are the same for everybody. For example, in the case of research integrity we have seen many disputes in Europe, but recently, the European Commission, in consultation with the member states, and inspired by the UK concordat on research integrity, has stepped up the rules on research integrity for everybody EU-wide in the 28 member states merely by changing this model grant agreement. It makes the rules of the game very easy and very predictable.

Q6 Viscount Ridley: I should declare my interests as president of the International Centre for Life in Newcastle, fellow of the Academy of Medical Sciences and vice-president of the Conservatives for Britain, as well as being a farmer. I want to take up the point about opportunity costs, because it is clear that if you are in, say, Horizon 2020 you have to collaborate with an institution in another EU country. To some extent that must mean that Professor X, who is thinking, "Who should I collaborate with?" might say, "Oh, I want a Horizon 2020 grant so I will collaborate with somebody in the European Union rather than somebody outside the European Union". He might do both, but, if he has a choice, he would end up doing that. Does that mean that it is possible that this is causing people to collaborate with lesser institutions rather than choosing the best in the world? Is that not leading to, say, Indian, Chinese or American collaborators being, to some extent, left out of collaborative research projects?

Professor Kurt Deketelaere: I would say it is just the opposite, in the sense that one of the key elements of Horizon 2020 is international collaboration and opening up to the world is one of the leitmotifs of the European Commission now in research and innovation policy. Of course, you need the necessary number of EU institutions in your proposal.

Viscount Ridley: But there is no need for ones outside the EU.

Professor Kurt Deketelaere: You will see your chances of success increase if you bring in other partners. Very often it is easy to do that if those other partners are not taking part of the financial budget, because they are funded by their own country, such as the United States, Australia or other countries worldwide. We see in those non-EU countries that there is a huge interest in participating in Horizon 2020, and we see all kinds of American, Australian and Chinese institutions coming to European institutions and saying, "Can we team up with you?" Very often in my group, for example, we have the luxury of picking the best non-EU institutions in a team for a proposal under Horizon 2020.

Viscount Ridley: How do you know that that opportunity would not be even stronger if it were not for the requirement to collaborate within the EU?

Professor Kurt Deketelaere: I can only say that if Horizon 2020 was not there, as the framework programme created by the EU and its 28 member states, then probably there would not be such a huge non-EU interest in this programme, which is of course the biggest worldwide-funded programme for research and innovation.

Lord Hennessy of Nympsfield: I should have declared my fellowship of the British Academy when I asked questions earlier. There are many ingredients that go into the capacity of our country, the UK, to think above its weight in the world. However, it seems very difficult, following up Viscount Ridley's point, to calibrate the EU element in thinking above our weight in the world. It is very hard at the best of times because a great, swirling mixture of

things goes into successful outcomes. Could you put a weighting on it? How important is the EU collaboration element to our wider capacity in the world as a thinking power?

Professor Steve Cowley: What makes us able to collaborate with the greatest scientists from around the world is the quality of our research and our research infrastructures. We have US scientists battering down our doors, because they want to work on our machine because it goes to much more extreme conditions. We have American scientists wanting to work with people in our area because we have the best numerical algorithms for simulating the behaviour of very hot plasmas. That is why we get good scientists to work with us. There is no question but that the European infrastructures have made us better and, by making us better, they make us collaborate with more people in the world.

Lord Hennessy of Nympsfield: So it is a very powerful and big factor.

Professor Steve Cowley: Yes.

Lord Hennessy of Nympsfield: Despite being only the 3% that Dame Janet was talking about.

Professor Dame Janet Thornton: I think it is, because where the UK leads in certain areas, we speak, effectively, for Europe. As we all know, the world is changing and the UK's position in the world has changed a lot over the last 50 years. The emergence of China and India as scientific powers, China in particular, is also causing change. They regard Europe as a balance against the US. There is no doubt about that. If we speak for Europe, I think we are much stronger than if we are only speaking for the UK. That is not to denigrate the UK, because we lead, with Germany, in the science areas where we are very strong, but being able to speak for Europe makes a difference. In fact, we were discussing before we came in that if we left the EU we have no doubt that there will be retribution. The gossips ask, "Is the UK coming out of Europe?", and in these discussions it is clear that there is a lot of antagonism if that should happen.

Lord Hennessy of Nympsfield: Retribution is a strong word.

Professor Dame Janet Thornton: I know.

Viscount Ridley: I want to pick up on that. You say that you speak for Europe, but do you mean Europe or the European Union, because, as you said, all three of you have non-EU members in your institutions? The UK, similar to Switzerland and Norway, would still be a very powerful voice for Europe as a continent.

Professor Dame Janet Thornton: If we were not part of the EU, I do not think we would be allowed to speak for Europe in the same way as we do now. For example, we have led ELIXIR. The UK Government have been strongly supportive of that. I do not think that would have happened if we were not part of the EU. We would not have the influence to decide and to drive the priorities in the fundamental challenges within Europe.

Lord Maxton: Why not, given that Professor Cowley said that we have our seat at this table because of the strength of our scientific institutions and scientific abilities?

Professor Dame Janet Thornton: That would be true if everybody was perfect, but, as we know, people are not perfect and will not always react in the way that we would like them to.

Lord Maxton: Would this last? If we withdrew from Europe, would it continue for more than a couple of years and then would the scientific strength of the UK come through?

Professor Dame Janet Thornton: I think personally it would be a lot more than a couple of years, and we would lose so much influence.

Professor Kurt Dekelelaere: Depending on the scenario on the table, what is leaving? Would the UK be in the situation of an associate country? Would it be something similar to Norway? Would it be bilateral? The point is in each of those cases, unless you go for a complete decoupling of the UK from the EU or Europe, whether you are an associate or a European Economic Area bilateral, none the less, you will always be bound by all the rules of the game in science, innovation and technology that are applicable in the EU28, and even beyond the EU28, with associate countries and the EEA and things such as that.

As a country, you are now in this fantastic position where everybody is looking up to you as being the leader for science and technology in Europe and you are able to determine what is on the agenda. Very often you are able to determine the final policy and contribute to the political analysis of a number of issues. At a certain moment in time, you would decide you were going to throw everything away, and throwing everything away by choosing to be an associate member or to be part of the Economic European Area will not liberate you, will not free you from what the EU is now doing in science and technology. If you leave, perhaps it will become worse. A lot of countries have already learned, of course, what you have been learning with those other member states. You will lose any kind of influence on the whole policy and budget, and you will have to abide by the rules if you still want, in one or another way, to play in that game.

Professor Steve Cowley: There is a great deal of difference between things in the area of science, where it is very international and all knowledge is shared, et cetera, and when you move over towards that boundary that we have been trying to develop in the UK, with things such as Innovate UK, which is how to translate our scientific excellence into growth, jobs and innovation in small companies, et cetera. The EU is not going to allow the kind of research that is adjacent to those small companies to go outside the EU. You can see that very strongly in the programmes in Horizon 2020, where they are looking at innovation. The point of that research is to do the research in the EU and bring home the benefits to the EU as much as possible. I do not think it is likely it will share that with everybody.

Q7 Lord Peston: I have just about understood that big science means big bucks or, rather, to change the cliché, enormous euros, since we might as well have our own European cliché. I want to ask about the freedom of movement within the EU of students and early career researchers, one of whom may be the next Enrico Fermi or the next Max Planck, and so on. Can you relate that to what you do in this area? Is there a problem, which we have found in another inquiry we did, with students coming here because it gets mixed up with the immigrant problem? The Government defines students as part of the immigrant numbers, even though the overwhelming majority of them have no intention of emigrating here; they only want to work here until it is time to go elsewhere. Can you clarify that for us?

Professor Steve Cowley: It is hugely important. It is similar to the Jesuits: if you get somebody to collaborate with you early in their career in science then you have them collaborating with you for the rest of their career—and not only collaborating but feeling very strongly that they want to enhance your scientific infrastructure. Having the best and the brightest from around Europe come to UK universities and study here makes an instant set of collaborations that will last for 50 or 60 years. You can see it. It is an empirical fact that

this is a way in which we make some of our very best collaborations and attract some of the very best people, who actually stay here. Hermann Hauser studied physics at Cambridge.

Lord Peston: To go back to my earlier question, because I am not clear about it, are they coming here because they want to work with the best equipment or because they want to work with the best scientists, or is it both?

Professor Dame Janet Thornton: Absolutely both.

Professor Kurt Deketelaere: It is clear you attract a lot of good people—students and researchers—because you have fantastic institutions over here. The question is how many of those people you will lose if you lose this absolute EU benefit of free movement of people. If those students and researchers are subject to the same rules as non-EU students or researchers coming into the UK now, then of course it is very likely that you will lose a significant number of those people because of financial reasons, political reasons, all kinds of red-tape reasons, and people will look for other locations to work and to study. EU students would have to pay similar tuition fees to non-EU students, to mention one example. Of course, the EU offers you an absolute vehicle and tool for free movement of people for its citizens, students and researchers, but once that is no longer applicable, of course you will still get fantastic people; the whole question is whether you are going to lose a number of them, which seemingly were the right people to get.

Lord Peston: To go back to an earlier question, the Brexit question cannot be ignored here. If we were to actually leave the EU, then this freedom of movement would disappear and it would go like that: bang.

Professor Kurt Deketelaere: Look at what happened in Switzerland. It said the freedom of movement rule was not applicable there any more so it had to invent a Swiss ERC funded by itself, it had to invent a Swiss Erasmus+ scheme, funded by itself, and, after a very short period of experience, it is already clear that a lot of people in the country are not moving any more. People are distrusting the vehicles that have been set up by the Swiss Government. Other countries are looking at those vehicles with a certain reluctance. To what extent is a Swiss ERC similar to an EU ERC? To what extent can a university in the EU28 accept Swiss Erasmus+ students? At the end of the day, are they getting equal degrees and going to pay the same? It is issues such as those. This has been a major surprise for Switzerland as an outcome of its own referendum, that suddenly all those things are no longer possible. If you could see the enormous diplomatic efforts it made after the referendum to ensure it could play again in pillar 1 of Horizon 2020, because for it the ERC is absolutely crucial, that illustrates how problematic this is.

Q8 Lord Kakkar: I should declare my interests as a professor of surgery at University College London, chairman of UCL Partners, and UK Business Ambassador for Healthcare and Life Sciences. I would like to turn to the question of the balance of regulatory power between the EU and the UK. Do you think that the balance is correct in the area of biomedical research and scientific research more generally? Do you have examples where there are particular problems with regard to regulation at a European level impacting research activity in the United Kingdom, or indeed examples of where EU-directed regulation has worked particularly well for us? There are of course a number of examples: data protection regulation, regulation on the registration, evaluation and authorisation of chemicals, the

deliberate release directive, importantly, the regulation on clinical trials, and the use of animals for scientific purposes, to mention some.

Professor Kurt Deketelaere: As a lawyer, I can perhaps comment on that because this is one of my pet topics. If you look at the treaty on the functioning of the European Union, it makes possible much more EU action in the field of research and innovation than the EU is taking. In a sense, the treaty is foreseeing a basis for the EU framework programme, for the European research area and for research infrastructures. On the basis of the treaty, the EU could do much more, for example, in proposing and adopting legislation in the field of science and technology, but it does not; it is very reluctant to do that because most of the member states are not demanding parties for that. Very often I see that my own rectors are not the demanding party for new EU rules in our field. It is clear that the UK—and many other member states—has been very successful in pushing back the EU and in using the legislative powers that it has in the field of science and technology. Obviously, you are right that there are a number of problematic EU initiatives for science and technology. To be clear, it is not only the UK which is opposing a number of those initiatives. All 28 member states are opposing a number of initiatives of the Commission, and very often initiatives which are made even worse afterwards by the intervention of the European Parliament. Using the example you gave on data protection, it was clear to us as universities that the proposal of the European Commission was still workable. It was only after it went through the European Parliament that it became completely unusable and has resulted in blocking medical, social science and humanities research. A final compromise will probably be made today on that regulation in Brussels. All of us, and not only the UK, have been pushing back on that. That is a very clear example.

If I take another example where there has been a positive influence, that of research infrastructure, about which we have been speaking, if you look at the ERIC regulation that the European Union has adopted, which makes it possible to negotiate to organise in a legal way consortia for the building up of research infrastructure, this has been a very beneficial initiative. If you look at the animal directive that was mentioned, it is clear that in this country the use of animals for scientific research has been a fantastically problematic issue. I am sure that the animal directive that the EU has adopted has helped to solve the situation in the UK. The EU says that animal research is still possible and necessary. We have the 3Rs approach, but medical research still needs animals to a certain extent. The fact that the EU did not give in to the European Citizens' Initiative calling for the abolition of this animal directive is a clear indication that the EU can be beneficial. We all hope that the upcoming copyright revision is also going to be very beneficial for all of us, creating a level playing field throughout the EU on text and data mining, on copyright and on open access.

A final example, which is also very beneficial for the UK and other member states, is the legislation on patenting, where we have now created an EU-wide system of patenting, unlike in the past where we had 28 different schemes. All in all, I must say the EU has been reluctant to use its legislative power in this field. In a number of cases where it has done so, it has been very beneficial to all of us. In a number of cases it has been problematic, and we must push back. It is clear that if you push back you can be successful. I would say the fact that there are a number of problematic ones is certainly not a reason to leave. It is merely a question of pushing back harder.

Lord Kakkar: Listening to your very full answer, it seems counterintuitive that 28 member states can be opposed to a particular form of regulation, as in this case regarding data

protection and its impact on biomedical research for instance, and there is still the risk that this scientific view that the regulation is damaging to the ability to take forward research, and therefore it is in the interests of all European citizens, can be overruled by other European institutions.

Professor Kurt Deketelaere: The problem there is not an EU problem. The problem is the people that all of us send to the European Parliament. To be correct, it is those people who really made a mess of the data protection regulation in the European Parliament. As I said, the proposal made by the European Commission was still acceptable and workable for us as universities and research institutes. It went completely wrong when a number of people in the European Parliament—in a very maniacal way, I must say, because of this discussion with the United States on privacy—came up with all kinds of amendments changing the text and introducing all kinds of obstacles to research. Obviously, at the end of the day the lesson is that perhaps we have to elect better people to send to Brussels and to Strasbourg. In that case, the problem was not in the European Commission.

Lord Kakkar: Let me turn to one other regulation, which is the regulation relating to clinical trials. I repeat my particular interest as an active biomedical clinical researcher. It has been suggested that the clinical trials regulations have resulted in Europe generally becoming much less competitive in undertaking clinical research. That is a different example from the one of data protection. How can it be that those regulations, which I understand also have caused considerable anxiety among European clinical researchers, have had such a detrimental impact?

Professor Kurt Deketelaere: I would say it is the same problem there, and it concerns the European decision-making process. The European Commission comes up with a proposal. The Parliament has no right of initiative at EU level, so every proposal that comes up comes from the European Commission, which in the case of the clinical trials directive was also an acceptable one. This is then consulted on in the European Parliament with all the different committees that are able to have a say on that, and very often it goes wrong. To mention another example of copyright and text and data mining, to our surprise, the opposition there is not coming from people in the Commission; the opposition is coming, for example, from the European People's Party in the European Parliament saying, "Okay, universities cannot be exempt from copyright and text data-mining rules. They must buy additional licences". I am very surprised that the biggest party in the European Parliament is coming up with this kind of rule.

Of course, at the end of the day, the Parliament is able to take a specific position and a text can only be adopted at EU level if the Parliament agrees with the Council. However, the Council is also an institution which is run by the member states. It is our own Ministers who are sitting in the Council rather than members of the European Commission. At the end of the day, the European Commission is not officially involved any more in any compromise that has to be made. Of course, behind the scenes it does its utmost to ensure that what comes out at the end of the day is acceptable. We have two problems. For us, as a lobby organisation, our daily business is making sure that the Members of the Parliament stay on the right track and making sure that our own Ministers who we send to Brussels stay in line with what is important for the European universities when they have to approve something.

Lord Kakkar: To summarise this, the threat from regulation, if it is right to describe it as a threat, is not so much overutilisation of regulation, or, indeed, the initial proposals for

regulation, but the way that the European Parliament sometimes deals with it on a less than well-informed basis which might therefore stifle research opportunities in Europe.

Professor Kurt Deketelaere: That is absolutely clear and the cases you have mentioned are very nice illustrations of that.

The Chairman: I am sorry that we have run out of time on this session. I apologise particularly to Lord Hunt, who I know had a question in mind, but I hope he will have the opportunity to ask the same question in the next session. I must be fair to those who are waiting patiently for the next session. Thank you, Professor Steve Cowley, Professor Kurt Deketelaere and Professor Dame Janet Thornton, for a very informative session this morning.