



# Select Committee on Science and Technology

## Corrected oral evidence: Life Sciences and the Industrial Strategy

Tuesday 31 October 2017

11.15 am

[Watch the meeting](#)

Members present: Lord Patel (The Chairman); Lord Borwick; Lord Fox; Lord Hunt of Chesterton; Lord Mair; Lord Maxton; Lord Oxburgh; Lord Renfrew of Kaimsthorn; Lord Vallance of Tummel; Baroness Young of Old Scone.

Evidence Session No. 11

Heard in Public

Questions 69 - 77

### Witnesses

Dr Caetano Reis e Sousa, Senior Group Leader, Francis Crick Institute; Dr Kathy Niakan, Group Leader, Francis Crick Institute; Professor Charles Swanton, Senior Group Leader, Francis Crick Institute; Dr Simon Boulton, Senior Group Leader, Francis Crick Institute; Dr Veronique Birault, Head of Translation, Francis Crick Institute.

### USE OF THE TRANSCRIPT

This is a corrected transcript of evidence taken in public and webcast on [www.parliamentlive.tv](http://www.parliamentlive.tv).

## Examination of witnesses

Dr Caetano Reis e Sousa, Dr Kathy Niakan, Professor Charles Swanton, Dr Simon Boulton and Dr Veronique Birault.

Q69 **The Chairman:** Good morning and welcome to you. Thank you for coming away from your important research and coming here to give us evidence. It will be very helpful to hear from you, particularly your views as scientists as they pertain to the life sciences strategy. We have read about the particular science you are each involved in. First, I am going to ask you to introduce yourselves. If you want to say anything by way of introduction, please do so. Otherwise we will go straight into questions.

**Dr Reis e Sousa:** Good morning. I am Caetano Reis e Sousa. I am a senior group leader here at the Francis Crick Institute. My laboratory has a research programme looking at how white blood cells get mobilised to fight infection and cancer.

**Dr Niakan:** I am Dr Kathy Niakan. I am a group leader at the Francis Crick Institute. Our lab is interested in understanding aspects of human embryo development and its application to stem cell biology. I am very happy to help the Committee.

**Professor Swanton:** Good morning. I am Charlie Swanton. I am a senior group leader as well here at the Francis Crick Institute, and a thoracic oncologist at University College London Hospital. My lab is interested in understanding the process of drug resistance in human cancers, why drug resistance is inevitable in solid tumours, why we cannot cure metastatic disease and how we can make drugs more affordable, work for longer and hopefully cure one day.

**Dr Boulton:** Good morning. My name is Simon Boulton. I am a senior group leader here at the Francis Crick as well. My group is interested in mechanisms linked to cancer, particularly in how the integrity of the genome is maintained. I also have an active interest in translation. I helped to establish a biotech company where I spend 20% of my time involved in science strategy.

**Dr Birault:** Good morning. My name is Veronique Birault. I am the head of translation at the Crick, so I have a unique role of being accountable for one of our pillar strategies, which is to accelerate discoveries and translations for health and wealth. I also have an unusual background, in that I am a chemical engineer with a PhD in life science. I have spent 16 years in industry, and in the last four years I came to UCL, and then to the Crick.

**The Chairman:** Thank you very much. My question is to all of you, but I can see that the question, as it is framed, pertains more to three of you and less to two of you. We would like to hear from all of you. You might answer it in terms of translations, how you might help, and you might answer in terms of what you had to do to take your science to innovation. It is clear you are all doing exciting science, and the kind of science that is likely to lead to innovations and improve healthcare. Do you think about taking your science to innovation? If you do, what barriers do you

think you might face, and who might facilitate you in that? Do you not think of these at all? We have been told by some other scientists that scientists do not think of their science going to innovation. They do not think about IP. They just do their science.

**Dr Boulton:** I believe a lot of academics do not think about translation. In part, that is a cultural issue. We are addressing that here at the Crick, as you have heard from my colleague. We are putting in place structures that help to educate academics in terms of how you can translate. This is not widespread in the UK and it could be significantly improved. The Crick could be a very good model for how you bring together the appropriate people to allow you to translate. It is a lack of understanding as to what is needed to take a discovery that we make in our laboratories, for example, to the next stage, and how you engage with venture, biotech and pharma. We really do not know, and we are changing that here at the Crick.

**Professor Swanton:** We spent about 18 months setting up, through the Crick, a spin-out called Achilles Therapeutics. I probably should have declared that conflict at the beginning—apologies. The aim of that is to try to find T cells in human tumours that recognise antigens on tumour cells that are present in every tumour cell.

It is the interface between science and business that I have spent a lot of time trying to understand. It is hugely complex and there are lots of problems. The science is complex. Delivering a product like this to patients in a five-year timeframe is high risk, unfortunately. You need access to long-term capital investment, and you need the entrepreneurs and the business-minded individuals to be able to drive a business model that will attract funding.

We were fortunate to work with Syncona, which is a spin-out of the Wellcome Trust, which has that long-term capital. It is pretty unusual but also quite remarkable. The people working for it are also very smart. They have had training in both science—they are PhDs—and business. They have developed a business plan. We have the right people on board and we now have up to £28 million invested in this company to develop a therapeutic for patients.

We have thought a lot about what the problems are. As I mentioned, one of the problems is access to long-term capital. How do you prevent a US venture capital company coming in, giving us series B funding and moving everything, lock, stock and barrel, to the US? That is a major concern. Syncona is in this for the long term and it has promised us it will continue to invest and prevent it moving offshore. That is important. How do you maintain IP? How do you eventually deliver a therapeutic into the NHS where you can control costs and improve survival at a cost the NHS can afford? These are all things I hope to be able to control to some extent.

Then there is the workforce. I do not think we have the workforce in this country that is suitable to deliver this life sciences strategy, to put it bluntly. What do I mean by that? We do not have the MD-PhDs in the UK that the US has. Thirty per cent of faculty in US cancer centres are MD-

PhDs. That is certainly not the case in the UK. What is the reason for that? In the US, there is an MD-PhD programme at university level. It trains 4,000 MD-PhDs at any one time in the US. We have equivalent programmes here. We train eight per year.

We are training our PhDs in medicine far too late. They are training in their 30s, when there is not time to learn the intricacies of science. There is an idea that we can develop four £20 billion companies in the UK in the next five to 10 years from this life sciences strategy. Without a workforce to be able to understand what the questions are in medicine and efficiently translate the basic science into the clinic, I do not think that will happen easily.

**The Chairman:** Thank you for those important comments. Dr Niakan, you work in an area that is seen as tomorrow's science, gene editing. As a scientist, do you think that your science may go to innovation? Do you get help?

**Dr Niakan:** Our particular research area is involved with human embryos and the application of novel genome editing techniques, so the inactivation of genes in a human embryo context, to understand the basic mechanisms of early human biology. One of the benefits we have had of working within the UK is that the UK is uniquely acknowledged as an international leader in having proactive regulation in this area. That includes horizon scanning by the UK regulatory authority, the Human Fertilisation and Embryology Authority, and scientific and clinical advances advisory committees. Collectively, together with legal teams, they provide the UK regulators with the opportunity to have dialogues about technologies and innovations that are sometimes not developed in the UK, and about the application of those technologies and techniques within UK sciences.

Our research directly benefited from that, in that those dialogues happened in 2009. All the regulations were discussed and those approvals happened before the technology caught up. When the technology was there to enable us to address these key questions—which have been acknowledged internationally as fundamentally important to our understanding not only of human biology, but of the application of stem cells, potentially, in regenerative medicine—we were able to quickly jump on that. That shows the strength of a pragmatic regulatory body. I sense the public feel that they have delegated this responsibility to this authority. That has helped provide innovation.

**The Chairman:** In terms of investigating science to take to innovation, you mentioned stem cells and regenerative medicine, both areas in which the UK was the leader at one time. We established the first international stem cell bank. A lot of our scientists who were then working in stem cells and regenerative medicine are now in the USA with companies that they have developed. We are trying to explore why our brilliant scientists cannot take their science to innovation in this country and it is the USA that they go to. What are the barriers?

**Dr Birault:** I would like to make a couple of comments. The UK has some strengths in taking some of its science to innovation. There was a report

from BioCentury in May that looked at innovation in Europe. Out of the 27 biotechs that were created, 12 were in the UK, so we have some strengths. There may be some limitation, as already highlighted, in how we grow our small companies to robust companies and protect them. That is for sure.

Some of the barriers are around the multidisciplinary team we talked about. In order to accelerate how those discoveries go to application, you have to embed applied scientists with curiosity-driven scientists. That is an experiment we are doing here. You have to embed people who can speak finance languages and science languages, such as entrepreneurs in residence and investors in residence. That is how you can create an environment where scientists feel supported to take their science to the next step of application.

**Professor Swanton:** Can I suggest one other thing? One other aspect here is that it is a question of incentives. Funders can play a role in incentivising translation and spin-outs where appropriate. Most of the application forms for grants, programme grants and what have you have very limited detail in terms of what you need to fill in about whether you have had a spin-out. It does not count like a *Nature, Cell* or *Science* paper would. It is not prioritised as an esteem factor outside this institute, where we are now increasingly being encouraged to think about this, which is fantastic. It is fair to say that that model is quite unusual in the UK.

Q70 **Lord Oxburgh:** Professor Swanton, you talked about the benefits of an MD-PhD. What about an MD-MBA?

**Professor Swanton:** There would be huge benefits there. One or two of my friends have done just that. Medicine is so complex now and requires such complex skill sets that there is a role to play there. The problem with medical training at medical school level is that we have paid a lot of attention to training post qualification. However, we have not done very much between the ages of 18 and 24, while you are at medical school, to think about how we can prepare the workforce for the problems, challenges and opportunities of the future.

Medicine is very much stuck in its ways: "You will be an NHS doctor. You will be a service provider. You will be in medicine, a surgeon or a GP". That is what has happened for the last two centuries. It will carry on like that for the next two centuries, without preparing ourselves for the problems inherent with Brexit and this life sciences strategy. The strategy is potentially fantastic if we had the workforce developing now for the future, which we can do.

**The Chairman:** You are a clinical oncologist. Are you an MD or a PhD?

**Professor Swanton:** I am both. I am an MD-PhD.

**The Chairman:** You did both.

**Professor Swanton:** I was one of the first cohort of the UCL MD-PhD programme in 1995.

**The Chairman:** So you did MBBS, then MD, then PhD.

**Professor Swanton:** No. I did a BSc, PhD, MB. It was an intercalated PhD.

Q71 **Lord Fox:** Can we introduce some more acronyms? KEF, the knowledge exchange framework, is being touted by the Government as a way of rewarding academics for their knowledge exchange and transfer in a similar way to publishing. That is obviously the current measure of academic prowess. First, has that started to impinge at all? Does anybody know about it and would it make any difference?

**The Chairman:** This is the idea that is floated, and Universities UK thinks it is not a bad idea. Alongside the TEF, the teaching excellence framework, and the research excellence framework, we now have a knowledge exchange framework. With both TEF and REF, money follows.

**Professor Swanton:** Anything that can be done to encourage broader interactions between science, medicine and industry is positive. Some may disagree with me, but I think it is fair to say that we all love doing science for science's sake. We love that. I love thinking about nothing else other than science. My limited insight into setting up a small company has been quite painful. It has tested me to the limits. I have not really enjoyed it hugely, but I can see it is necessary if we are going to commercialise medicine and get it into patients quickly. I cannot do that in the lab. Having those opportunities and having the powers that be, both within this institute and outside, approve of those activities makes my life a lot easier. I do not have any pressures from within the institute not to translate.

**Dr Reis e Sousa:** I wanted to add to the mix the fact that it is not necessarily a matter of not having the appropriate reward that is setting the limit. We have to think about the overall drive of the individuals concerned. My colleague put it very well. He is driven by the science, but he is also a trained doctor, and driven by patient need and the opportunity he sees in commercialising a certain type of medicine, in the hope that it will lead to better patient care.

For others who are discovery scientists, what gets us out of bed in the morning is not necessarily the thought that we are going to find something that can be immediately translated into patient benefit. It is the excitement of the discovery. I think we share that with all sciences, including the physical sciences and others.

It is true, however, that in the life sciences there is that additional incentive: the thought that what you are doing might help in terms of better health for the population. That is always there. It is something we can work with and try to promote in making sure that, if those barriers are sufficiently low, people take that step with ease. You cannot force people down that way without understanding their motivations. As has already been mentioned, there are different types of people involved in health life sciences research.

Q72 **Lord Hunt of Chesterton:** What is your response to the Bell strategy?

Will it help improve the quality and quantity of life sciences and their funding in the UK? You have already commented on it, but perhaps others may have some views about the Bell strategy.

**Dr Birault:** Paul has already highlighted that it has the right elements in it and the implementation is going to be the challenge. HARP is going to provide some additional funding. Some of it will support translation. It is not very clear how this is going to be distributed.

One of the key elements is how some of the research councils have been really important in supporting translation, such as the MRC and its scheme. That is the "Confidence in Concept" scheme. For an institute such as the Crick, where we are at the foothill of translation, that enables and facilitates how we do those critical experiments, gain confidence in the concept and progress them to the point where they can be adopted by industry or VCs. How the funding towards that will continue and may be increased was not very clear in the strategy.

**Lord Hunt of Chesterton:** Can I ask you one question that comes through this report? That is the role of citations as being some sort of measure of quality. I am a scientist, and I find the citation business ridiculous. Pure mathematicians do not get a citation for 10 or 15 years after they publish the paper sometimes. In other subjects, chemists boil up some little thing and they write a paper the next day. It is so uneven.

**The Chairman:** Your answer might say, "Life must be bliss as a mathematician".

**Lord Hunt of Chesterton:** I wonder whether a new light on this whole issue of how science is regarded, and therefore funded, is coming out of your institute.

**Dr Boulton:** It is too early to say. We have a strategy here that will help this, but there is still very much a view that we are judged based on our productivity, where we publish our work. The point that Lord Fox made is very valuable. There might be strategies that provide an alternative measure of somebody's achievements, for example through the kind of work that we do in our laboratories, in terms of discoveries that we publish.

The challenge is that many people, if they want to translate, feel that they need to go into a stealth mode to give themselves a competitive advantage. They are not offering this valuable information to the general scientific community. That is then hidden, and it is very difficult to assess that measure of where the programme is going. Particularly when you start dealing with investors who are putting in large amounts of money, they do not want you disclosing this information to anybody else. It is a big problem.

**The Chairman:** Let me ask a question of Dr Birault. Is that not a fallacy there, the assumption on the scientist's part that disclosing your science, or getting an IP, then forbids you from publishing? Is it not a fallacy, thinking that?

**Dr Birault:** It is important that there is a protection at the beginning when we develop innovation. Here it will certainly never prevent the scientist from publishing. We have to publish our findings. It is how we protect our findings and the timing of it that is important. It should not stop scientists publishing their science.

Q73 **Lord Vallance of Tummel:** My interest is in how you pull through commercialisation from science. We talked a lot about this earlier on. There are two specific things I would like a little illumination on. I have no experience of spin-out. I do not know what it is about. Can you tell me what you think is a sensible balance between the interests of those who put up the capital, individual scientists who have put forward the intellectual side of it, and the institution itself, the Crick? What should be the balance between the three? A lot of this is to do with motivation: who is doing what and why. Those seem to me to be the three most interested parties.

**Dr Birault:** Caetano made a very important point that it has to be driven by the scientist who wants to follow that route to take their science forward. Every time we go down that route, we have considered other routes. It is important to think about a tailored approach. We consider those routes by having some of the experts embedded with us. That is the first thing.

When we decide to go down this route, it is a balance about protecting the interests of every party that comes to form that spin-out. The investors will want to have a return on the investment. That is what they are here for. They provide a very important asset: a team of experts and the funding that will be necessary to do the first step of getting a proof of concept.

The institute has to protect its academic endeavour. We have to protect how we can continue to publish. That is where the tension usually comes in. For the individual, they have to find how they can balance their academic endeavour and their business endeavour, with the institute protecting them. Every time it is different.

**Lord Vallance of Tummel:** Can I be cruder? I am not talking about academic interest. I am talking about financial interest. In a spin-out, what is a reasonable balance between those who put up the capital and those who have had the good thoughts and may have an equity interest or whatever else in the spin-out? Should the institute itself have an equity interest in the spin-out? If so, what should it be? Should this be a source of potential income for the institute itself?

**Dr Birault:** The Crick has a very special set-up. The translation is core funded, which allows us to have a long-term view of how we put our innovation into capable hands and how the reward comes to the Crick. In order to not stifle the innovation, we take the view that we should go for a long-term view. The revenue that comes to the Crick should be a late-stage milestone, like registration or royalties. That enables the business to do what it should be doing, which is developing the innovation.



We are not looking for up-front payments for licences et cetera. That will be detrimental to progressing the innovation. That is something special that Sir David Cooksey and Paul have been behind, making translation core to the Crick and allowing us to have that long-term view.

**Lord Vallance of Tummel:** Perhaps it is too complicated to go into the detail. Can I come to my second question? In the written evidence from the institute, it says that there should be an ecosystem approach to innovation, and there should be the right skills embedded in the academic environment so that discovery science with potential for translation and development of IP can be identified and nurtured. Can you tell me a bit more about what you think the ingredients of the ecosystem should be? What skills and experience are we talking about, and how should they be embedded?

**Dr Birault:** First, we have some scientists like me who come from pharma who are embedded with us. We have a collaboration, an alliance, with GSK and AZ. They have scientists embedded with us who do precompetitive research and work side by side with our scientists. The experiment we are doing is, by having curiosity-driven scientists with applied scientists, to get the foundation of the science that will have the potential to be translational science. We can also increase the probability that we identify translational science. We have technologists who are here from different technology companies as well.

The other mix in the ecosystem is entrepreneurs, which as Charlie mentioned are really important. We have entrepreneurs working with us, working side by side with scientists. At the inception of the idea they discuss how we shape those programmes, so when projects develop they already have the right form.

We have investors in residence. We have Syncona from the Wellcome Trust. It is highly supportive and gives people pro bono. It is the same arrangements with SVLS to shape our programmes toward investment.

The clinicians are the fourth area. How do we embed clinicians from our university partners? We have Charlie, and we are very grateful to have Charlie, but we need more clinicians to be embedded in the Crick. They bring the clinical insight we need in order to do the innovation.

**Lord Vallance of Tummel:** It is a bit like a specialised Innovate UK. Perhaps that is a tricky question.

**Dr Birault:** Experts are embedded here, so the proximity is very important. Those experts are on tap in the building with us, and are able to talk science in the multilingual way you talked about. It is important to be multilingual, to understand how you can speak the science language, the finance language and the business language. It is core of what we are creating. We are developing our scientists and the post-docs to be multilingual through the training as well.

**Lord Vallance of Tummel:** Thank you very much. That was very interesting.

Q74 **The Chairman:** There is all this talk about science, innovation and

industrial strategy. Will it make scientists who just want to do science and not think about taking it to innovation feel that you will not be valued as a scientist if you are not also the scientist who takes the science to innovation? Do you worry about that, or do you think, "Let them carry on and I will do my science"?

**Dr Reis e Sousa:** There is a danger of that, of course. One thing that is emphasised in this particular strategy is the need for a very strong and wide science base. Provided that is really seen as a fundamental pillar of the strategy and is not forgotten along the way, that value will be preserved. The notion that everything will happen just by lowering the energy barriers has some merit to it. There will be some discovery scientists who will be more prone to try to find an application and move their findings into an innovation path.

There is one particular resource that is always limiting, no matter what, and that is time. In the end, you will always have to make a personal choice in terms of your time investment into each one of these activities. Ultimately, that is dictated by your interests and motivation.

**Lord Maxton:** You are all very committed to extending the life of people through the research that you do. Are you aware that there are enormous political problems associated with that? I talk as the professional politician here. If you extend people's lives, the number of people who are going to be paying taxes to pay for the people who are going to live longer gets smaller and smaller. That must be something that concerns all scientists as well.

**The Chairman:** I do not know that that is a question that is in your mind at all. If it is not, I do not think we will worry about it.

Q75 **Lord Mair:** The question I have is to both Professor Swanton and Dr Birault. If a young researcher here in the Crick Institute has a great idea and thinks it would be terrific to try to exploit that, what is the first thing that you say to him or her? If he or she comes to you and says, "I have this great idea", what next?

**Professor Swanton:** It depends what the idea is, obviously. I can only speak from experience, working here and before at its predecessor at Lincoln's Inn Fields. The great thing about science is you can make the impossible possible. To squash enthusiasm in a junior scientist who is on his or her way up is criminal. Nobody here would do that. The great thing about this building is you can walk into a Nobel prize winner's office and call them by their first name. Assuming they are in, they want to talk to you and they have time, you can get very important information from them that will help lead the science. I have never found it a problem. It is very easy to get enthusiastic support for the work you are trying to do.

**Lord Mair:** What about if they have a great idea and they want to spin it out?

**Professor Swanton:** In terms of spin-outs, that is encouraged too. There are not any barriers here. There really are not. It has been incredibly straightforward. What has been difficult is finding the money,

finding the investors and finding the right investors who also believe in the science and will provide some latitude for you to get on with the science and translate it. Finding the right investor is much harder.

**Lord Mair:** That is behind my question. Here comes this enthusiastic young researcher who has a great idea and wants to spin out. What happens next? How do you help that researcher to address those very questions we have talked about?

**Professor Swanton:** That is what Veronique's team does, and it does it very well. It is extremely encouraging. It is a collegiate relationship. We talk through the problems. We have legal counsel who can help with the IP. They have lots of contacts, VC and what have you, to access funding. As we have discussed, it is fair to say capital investment in the UK is not as good as it is on the west coast of the US. That said, they do a good job and there is money available for the right idea.

**Lord Fox:** I have a very quick question with a one word answer, I think. Dr Birault, are you having too many people walking through your door with ideas or too few? If it is the latter, how do you encourage it?

**Dr Birault:** It is the earlier. We have more ideas at the moment than we can support.

**The Chairman:** You talked about having been a clinician before. Sir Paul Nurse in his evidence said we need to change the NHS to become a research organisation. The enthusiasm of bright young clinicians and scientists is killed off by what our NHS demands of them. Do you disagree?

**Professor Swanton:** You have raised a very important point, Lord Patel. I completely agree with you, and it is a big problem. That is why we need to train PhDs much earlier in their clinical careers, before they become jaded by service and the pressures of running a 70-patient clinic with two clinicians, one of whom is sick and off, and one who has to handle it on their own. It just grinds you down after a while. You do not have time to think about science. You are just focusing on service.

I completely agree we need to think about the NHS as a research organisation. That will need funding. We have not talked about the problems of leaving Europe, harmony of clinical trial directives and what have you, or what will happen in terms of regulatory aspects.

**The Chairman:** Lord Fox will be coming to it.

Q76 **Lord Borwick:** Talking about academic reputations, should the Nobel prize for medicine be given to somebody who has exploited their medical invention and made it commercial? In the judgment of academic excellence, should there be an innovation aspect to that, or should academic excellence just be judged on the originality of the medical developments?

**Professor Swanton:** There is room for both. I cannot speak to the Nobel prize committee, but there is room for both. Basic science and the pursuit of science for science's sake should be lauded and rewarded, as it is. As

this life sciences strategy is doing, we can also prioritise translation and industry spin-outs. That is also important. I am all for generating wealth for this country to spin back into further R&D. That is what we are here for: for science.

**Lord Renfrew of Kaimsthorn:** It does not seem to be happening at the moment.

**Professor Swanton:** No, but it will happen, because of this life sciences strategy, hopefully. I am confident it will work if we have the workforce in place.

**Dr Birault:** It takes a long time to translate science. If you think about Paul's discovery about cell division, it is only now that there is a medicine that treats patients with cancer. It is the same with toll receptors. Toll genes were discovered 20 years ago. It took a long time to arrive in a vaccine. We have to accept that it takes a long time to translate fundamental science to medicine. The pillar of innovation is very good science, excellent science, translates.

**The Chairman:** That is an important point. There is a timescale, so the investment and support has to be longer term.

**Dr Birault:** Yes.

**Lord Hunt of Chesterton:** Is the speed of translation different in some countries than others? The United States, as you say, has thousands of MD-PhDs, and so on. Does it actually lead to more rapid translation? Is that a bottleneck for the UK? Maybe it is in other areas.

**Dr Birault:** What is essential for translation is multidisciplinary, having different disciplines together. If you look at Boston, on that road where there are—

**Lord Hunt of Chesterton:** 128, is it?

**Dr Birault:** Yes. Harvard, the business school not far away, the engineers mixed with cancer biologists in the Koch Institute. They are all in the same place. This concentration is important to accelerate how you take discoveries to application.

**The Chairman:** Just for the record, is it not true that to take science to discovery and treatment, like a medicine, takes a longer time? That is what you talked about earlier, about Paul Nurse's cell science. The other stream that we have not discussed at all, because you are all scientists in that respect, is that in the United States what is faster is the diagnostics. Do you have a comment about that?

**Dr Birault:** Diagnostics are faster to develop, yes. It is the same for certain technologies that support the healthcare system. They are faster to develop. It is complex to develop a new therapy. It has a lot of hurdles to go through.

Q77 **Lord Fox:** The sense of surprise has been taken from this question. Brexit, in the evidence submitted and also Sir Paul's, has the potential for a negative impact on the whole life sciences sector. Assuming it happens, we have talked about its immigration aspects. Could you allude to some

of the other potential challenges, how the country might go about ameliorating those challenges and whether they are temporary or long term?

**Dr Birault:** Paul made very relevant points for us. We have to have access to talent across different areas. That is going to be critical.

**Lord Fox:** What could the country do symbolically in order to make that talent feel welcome?

**Dr Birault:** Make it easy for them to come with their family, with their husband or spouse finding a job, and their children being able to settle here. That is going to be important to attract talent.

**Dr Niakan:** It is this sense of a welcoming spirit. I do not know if it is true, so please forgive me, but there has been this analogy to an elite sports athlete. It is quite difficult to get that level of training, to retain that talent and to encourage that talent to feed back into the engine of growth in the UK economy. There should be a sense of celebration of that person joining the UK community. That is really important.

**The Chairman:** Well said.

**Dr Reis e Sousa:** There are two aspects to this. One is what is happening now. The other one is what will happen post Brexit, if it happens. Down the line we do not know what impact it will have. Right now, the uncertainty of this period is already having a detrimental effect.

One step that could be taken immediately is to end that uncertainty for those who have chosen to make the UK their home and whose status is indeterminate at the moment. That is already causing a lot of anxiety among the scientific workforce in this country, leading people to begin contemplating decisions that they would not have contemplated before the referendum. If a clear statement were to be made about their status, that level of uncertainty might be reduced and that level of anxiety brought down to a more manageable state.

**Lord Fox:** That is helpful. Picking up on Dr Niakan's analogy of elite sportspeople, one thing we alluded to in an earlier report is a programme of active recruitment at a nationally supported level. That would be in terms of helping international scientists to come to this country. Would that be too crude, in terms of actively going out and trying to transfer people in from other countries and other research organisations?

**Dr Niakan:** I think I could safely say that we would very much welcome that. We do that in our recruitment process. For example, if we are at a seminar and we hear a really exciting area of research being talked about, we are encouraged to approach the individuals and encourage them to apply to and join our institute to contribute to the greater good.

**The Chairman:** This may be a difficult question to answer. Do you know of or have you had your own experiences of other European countries, in the light of what happened with Brexit, trying to recruit our scientists?

**Dr Reis e Sousa:** I think we have all, in particular those who are EU citizens, been already approached by a whole variety of other

organisations in a whole variety of countries. There is a steady stream of that in any case, but there has been a clear increase in those sorts of approaches since the referendum. This is anecdotal, but you speak to colleagues and you hear about these approaches. Some of those have been successful. We all know of people who may not have declared it yet but who are seriously thinking of moving elsewhere as a result of those approaches.

**The Chairman:** That would be sad. Thank you very much indeed. It has been most helpful to have this session with scientists and with you. We can see now how the Crick itself is developing in understanding of how science must be taken to innovation. Your evidence today has been very helpful to us. Thank you very much for coming.