



Science and Technology Committee

Corrected oral evidence: Delivering a UK science and technology strategy

Tuesday 22 March 2022

11.15 am

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Members present: Lord Krebs (The Chair); Baroness Blackwood of North Oxford; Baroness Brown of Cambridge; Viscount Hanworth; Lord Holmes of Richmond; Baroness Manningham-Buller; Lord Mitchell; Lord Patel; Lord Rees of Ludlow; Baroness Rock; Lord Sarfraz; Baroness Sheehan; Baroness Walmsley; Lord Winston.

Evidence Session No. 10

Heard in Public

Questions 81 - 89

Witnesses

George Freeman MP, Parliamentary Under-Secretary of State (Minister for Science, Research and Innovation), Department for Business, Energy and Industrial Strategy (BEIS); Alexandra Jones, Director of Science, Research and Innovation, BEIS.

USE OF THE TRANSCRIPT

This is a corrected transcript of evidence taken in public and webcast on www.parliamentlive.tv.

Examination of witnesses

George Freeman MP and Alexandra Jones.

The Chair: Good morning and welcome to our second panel of witnesses. Thank you very much, Science Minister Freeman and Alexandra Jones, for joining us today.

Before we start with the questions, I remind you that the session is being broadcast on the internet. A transcript of the session will be sent to you in a few days' time for you to check and send in minor corrections. If you do not manage to cover anything in the hour or so that we have and if you would like to provide additional evidence, please feel free to write into us. We welcome that.

If that is all clear, I will turn to our first question and ask Lord Parry—Lord Mitchell, sorry—to come in.

Q81 **Lord Mitchell:** Thank you, Chair. It always happens. Thank you very much for joining us, Minister. This report we are doing is of the moment and these questions we ask are pertinent.

My first question is simple. How do you view your role as science Minister in contributing to the design and delivery of a UK science and technology strategy?

George Freeman MP: Thank you, Lord Mitchell, Lord Krebs and the Committee for having me. It is great to be here.

To take it from the top, as Minister for Science, Research and Innovation, the central mission that the Prime Minister, Chancellor, Secretary of State and I have agreed is to take this moment. By that, I mean this moment as we emerge from not just the pandemic but quite a difficult decade, with the pandemic preceded by the Brexit political stalemate, the divisions of that vote and the short-term funding announcements. It has been by any measure a volatile and difficult period for everyone but particularly for the science community.

The moment that we have identified is a moment for the UK as part of our new role in the world, as set out in the integrated review, to be much more strategic about our deep science and technology leadership in two fundamental ways: globally and domestically. I have defined the global part of the mission as the "science superpower" mission and the domestic part I have defined as "innovation nation". The best way to answer your question is if I describe my definitions of those key elements.

The way I have defined "science superpower" is to mean how we can make sure that the full value of UK science is harnessed for full global impact and recognition and is able to receive the level of global support and impact that it deserves. That means, first, funding world-class science as the bedrock to everything.

Secondly, we need to recognise that we are in an increasingly international world, despite all the difficulties. Science has been a force for internationalism. The second piece is about talent and making sure

that we build an open talent pathway for global talent to come here and for our scientists to go around the world and be international.

Thirdly, we need to make sure that UK science is punching above its weight in terms of global impact to help solve challenges, from helping to feed 9 billion mouths to preventing the melting of the icecaps to understanding the oceans and space. It is to make sure that our formidable science community and ecosystem has full global impact.

Fourthly, we need to attract much bigger global R&D investment into the UK.

Lastly and perhaps most importantly, we need to harness the full impact of UK science for geopolitical soft power. I have said elsewhere, and so I cannot think of a reason not to say it here, that I would argue that UK science has done more for global security in the Covid, Ebola and Zika crises than perhaps we have done militarily in Iraq and Afghanistan. That is a big statement to make, but I made it on HMS "Prince of Wales" with the now Chief of the Defence Staff and he agreed with me. There is something there about science as a force for good and the UK thinking of our science expertise as something that we can harness for more geopolitical influence.

The "innovation nation" piece is about our domestic economy and making sure that we tackle the long-standing problem of too often failing to capture the economic potential of brilliant discovery and not scaling up enough. That is about the Innovate UK landscape, working with sectors and with companies, building clusters all around the country, to support the Government's wider levelling-up agenda. My argument is that we do not level up by undermining the golden triangle; we level up by keeping it golden and growing from being a discovery economy to a development economy, and the "D" can go all around the country and we have 30-odd clusters.

Lord Mitchell, I define my role as trying to make sure that as well as overseeing this precious jewel of research ecosystem, we make it count for more internationally and count more for economic recovery in this country. You have probably heard me say many times that this is the only way in my view that we will get out of debt sustainably and tackle the structural deficit. We will not cut, borrow or tax our way out. We have to be home to sectors growing at 50% or 100% a year, the sectors of tomorrow, and they are science-based. Our innovation strength gives us a huge opportunity to do that.

Lord Mitchell: Thank you for that. One of the points you made is a point that I think we have all heard since we were at school: basically, this issue about this country being brilliant at science but being pretty bad at transmitting that, monetising it and making it effective. What are you doing that will break down those barriers so that we truly have a sort of Silicon Valley with Stanford and everything else and make that happen on a commercial basis?

George Freeman MP: I am nodding because I lost most of my hair in my 15-year career in and around universities helping to commercialise science and help support leading-edge science.

To answer your question specifically, I am using my hands, Lord Krebs and Lord Mitchell. On the left-hand side is the “science superpower” piece. We have to make our UK ecosystem—UKRI, the research councils, the public labs, our research universities—compete and take on China investing £240 billion a year and America £180 billion a year. We are going from £15 billion to £20 billion and then £22 billion, which is fantastic, but we have to make that hum like a Formula 1 engine. It has to be the best and most agile and creative. There is a whole piece around implementing the Grant, Tickell and Nurse reviews and making sure that our system supports deep blue-sky science, deep industrial partnerships and nearer-market commercialisation. Some of that is to do with the incentives, the REF and the career pathways.

The real challenge is more on the “innovation nation” side, which is about getting much stronger industry engagement into the catapults, which we are doing. It is about having a clearer landscape for international investors to see what they can invest in, which we are doing. It is about moving from a start-up economy to a scale-up economy. A lot of good work is being done on that, not least by the ScaleUp Institute. We work with the Treasury on changing the rules for pension and institutional investors so they can now invest in UK equities and high-growth companies. The chief scientist and I work hard to ensure that the “can” becomes “do”. That will also require sighting our big institutional investors better on what is coming and getting the City of London to apply some of its financial genius to bringing through science and innovation and floating and financing here.

Two other things: we can use our post-Brexit regulation freedoms not to race to the bottom but to race to the top and to be more agile in setting international standards, whether in autonomous vehicles, nutraceuticals, gene editing or satellite launch. If we could set some good, strong, clear regulatory frameworks that would take the EU 10 or 20 years to do but we could be more agile, it would help boost investor and consumer confidence.

Lastly, if we are to deliver this mission, we have to be prepared to be a little more strategic about our procurement and making sure we use some portion of the Government’s procurement to drive innovation.

Lord Mitchell: I just have one more on—

The Chair: We do need to move on, but we will come back to you if there is time at the end. Thank you very much, Lord Mitchell.

Q82 **Baroness Manningham-Buller:** Minister, thank you very much for your introduction. The committee is interested in many of the things you mentioned but also the structures. How do you think the National Science and Technology Council is working? Is it doing what it is meant to do and pulling together science and technology initiatives across the piece? Is it too early days? How do you see it coming along?

George Freeman MP: Thank you. I think it is fair to say that this is quite a new approach for the UK. I would argue that, for 40 years, we have thought of ourselves as a service economy that does deep science in fantastic silos quite often and occasional innovation. Putting in place the architecture at the heart of government to be much more strategic is quite a change, as you will know as well as anyone.

I returned to government at the end of September. We have had our first meeting of the NSTC. It was the first ever meeting and Patrick Vallance and I set out the mission. It was chaired by the Prime Minister and deputy chaired by my Secretary of State. I sit on it as a fixed member as Science and Innovation Minister. It is fair to say that we are in the foothills of beginning to use this machinery to be more strategic. I am thrilled that it is in place.

I have made the case before that however energetic an individual junior Minister is, if we really want to deliver this, we will need that machinery of government. To have, as we do, in those meetings on one side of the table the Prime Minister, the National Security Adviser, the chief scientist, the heads of the agencies and the key professional officials, who are best sighted on both the geopolitical and the technological global landscape in which we operate, and on the other side of the table the senior Ministers who have the authority to make quite strategic decisions, is a huge step forward. Our second meeting is coming up. As with all these things, it is a work in progress.

The big challenge is to make sure that the NSTC works in a genuinely strategic way serviced by the OSTs and presents papers for consideration that set out clear analysis of potential opportunities and challenges for decision. That is the instinct and the ambition, but we need to establish that heartbeat.

We will get into this, I am sure, but several areas are coming up, such as in our space strategy, a £16 billion sector. If we want to grow it, we will have to make some quite interesting decisions about how we grow it and the role of OneWeb and our ESA membership. Those are decisions I relish, but they need to be presented clearly and comprehensively.

Baroness Manningham-Buller: Do some of the challenges you face represent not only co-ordination across departments but difficult choices in economic circumstances? I speak as someone scarred by watching the Labour Government try to do joined-up government. That was pretty painful and did not work. You are trying to do something similar in terms of co-ordination. What do you anticipate will be the major difficulties in doing that?

George Freeman MP: You are right. Tough choices have to be made there and also, as you hinted at, there needs to be a mechanism for even just the implementation of less tough but none the less cross-government policies. To that end, I am establishing a cross-ministerial group of the Ministers with R&D clout and so I have—

Baroness Manningham-Buller: That is where the problems will arise, I anticipate, but I am sure you will sort out the Ministers.

George Freeman MP: I can but try. But you will have noticed that BEIS's share of the overall science budget is falling from 77% to 71%. I relish that because it means that the MoD has a serious budget, DH has a serious budget, DfT, where I was before, has a budget, and Defra. There are seven or eight of us. Quite often in government, the silos of interdepartmental jurisdiction often get in the way of joined-up government. It seemed to be incumbent on me to set up an informal group of Ministers. We have all had bilateral meetings and are now about to have our first joint meeting to provide some advice and some ministerial energy to solve problems.

The Chair: Thank you very much.

Q83 **Baroness Brown of Cambridge:** Thank you, Minister Freeman, for coming to give evidence and my apologies for not being able to be with you in person today.

Some 30 years ago, when I first joined the then new Technology Strategy Board, we were talking about how we would use government procurement to stimulate innovation in the UK. We now hear that the Government want to use public procurement to support development of strategically important technologies.

What will be different? What will this look like? How will it achieve a very different end from all these initiatives we have had before?

George Freeman MP: Thank you, Baroness Brown. Perhaps I could in a moment bring in Alex Jones, partly on the last question because there is also quite a strong inter-official group between departments.

Baroness Brown, to take your question, in some ways, we are attempting to do what successive Governments have recognised is needed. I am not being flippant, but in some ways, I hope that not much changes. You will have noticed that I have called the innovation piece of work the "innovation nation", which the eagle-eyed among you will notice was a Labour Party paper back in the 1990s. I did that deliberately to try to signal that this is not a partisan project. It is a strategic UK mission, and it has been shared by successive Governments over the years. The point is we have decided now we need to put a bit more financial muscle in the CSR but also political and machinery of government muscle behind it.

To answer your question, Baroness Brown, on what I think will change, there are some specifics that I will talk to, but the big change we will know when we see it. I think of this as a 10-year strategy but we need to see some quite substantial delivery in the next three or four. I suggest that on the research ecosystem side, research is saying that this is better, less bureaucratic and much quicker. We have set up these global talent fellowship programmes, which are good. We are getting more people from around the world here. We have slowed the haemorrhage of our brain drain and the best people being poached. We have made it a more agile and multidisciplinary research engine.

On the “innovation nation” side, we are attracting much more global industrial funding and I am setting some metrics across BEIS at the moment for how much we attract in each sector. That needs to go up. Getting to £100 billion extra in the next six years to deliver 2.4%, I am absolutely sure, will not just happen. It requires us to have a plan for it and to allocate it. I suspect the life sciences sector could probably bring in £10 billion to £15 billion and the space sector something similar. Breaking it down and then working out the policies to deliver it, for me, is the big change.

Finally, we need a much more impactful international profile and role so that people can see, from the British Antarctic Survey to agritech to digital health, we do not just develop brilliant innovations here but we deploy them globally.

Baroness Brown of Cambridge: Sorry, I fear the technology may have caused you not to hear my question, which was specifically about the fact that we have been aiming to use public procurement for the last 30 years to help us to do this. What will be different about the public procurement and why will it work this time and help to deliver this real change in outcome?

George Freeman MP: Apologies. I have three answers. One is culture change. That is why I framed my earlier comments around the scale of this shift. This is intended to be and needs to be seen and felt around Whitehall as a big change in our commitment to make some much more strategic choices on behalf of UK science and technology leadership.

The second is regulatory change. We are no longer subject to the same state aid rules. We are much freer to be more strategic in our own interests.

I will give you some specific examples. On life sciences, through the pandemic we have demonstrated that things that the noble Baroness Blackwood and I in the past had only dreamed of being possible were possible. We put together the world’s biggest clinical trial, bigger than the next 10 put together, in three months, a quite extraordinary demonstration of what is possible. We cannot live in a permanent emergency, but keeping some of that art of what is possible and that spirit of what is possible and that culture is key.

There is a huge regulatory opportunity which I highlighted in the TIGRR report that I did earlier in the year. I set out 10 high-growth sectors where, without primary legislation, we could create a more friendly regulatory framework for investment and the UK as a global test bed. On issues like AI, Minister Philp at the DCMS and I work with colleagues in other departments—the Department of Health, the DWP, the Home Office—to see whether we can deploy some AI as part of their core fundamental tasks.

I hope that begins to answer your question. There are some reasons why we can do things differently and there is an ambition to do things differently.

Similarly, with the MoD and space, defence procurement, which has its own history, has traditionally been quite heavily driven by buying equipment from our allies or sponsoring our own UK. In the space strategy, we have set out an ambition to make the UK a global cluster of science and technology and that MoD procurement will begin to open up with competitions and chances for people to bid. We are in the foothills of this, but I can see some real ways this could and should change.

Perhaps I could bring in Alex Jones on that and Baroness Manningham-Buller's point.

Alexandra Jones: Of course. It is striking that we have been trying to reform procurement for a long time. When we spoke to business—we had an innovation expert group as we put together the innovation strategy—and time and again procurement came up as an important issue that would genuinely change the way that businesses were able to innovate and work with government.

How will this be different? Systemic change is always challenging, as the Minister says. We have the Cabinet Office post-EU exit looking at ongoing reform of procurement, simplifying process, increasing flexibility, helping public bodies procure more innovative solutions and looking at regulation and other things.

We also try to focus on specific issues. We have two governance groups in government trying to make sure we talk about and share lessons across the piece. Patrick Vallance and Jo Shanmugalingam chair the R&D board, which brings together all the departments looking at R&D to talk about a wide range of issues and share good practice about some of the things we do.

We also have on the innovations side an officials group, which I chair, that brings together people to talk specifically about how we try to tackle the commitment in the innovation strategy to be much more proactive and long-term about government procurement. One commitment was that, where appropriate, we should produce a clear overall policy problem statement for procurement describing priority outcomes that aligns with the public value framework but trying to make sure we share expertise between government departments at a level at which we can have those conversations and make sure we learn from each other. We focus on a smaller number of things to change the specifics. There is something about systemic change. There is something about the specifics and officials working together to share good practice to see how we can do that.

We also have a business innovation forum, which is an opportunity as well to bring together some of the businesses and some of those who work in this area to ask them how we make it different this time and how we try to make sure that genuinely this sticks.

It is always challenging. We have some specifics as well as a systemic change. We try to make sure we work together but cross-government work is always hard, so we are doing it on specific issues. Then we check

with the businesses so they can tell us where it is working and where it is not and we can respond.

Q84 Lord Rees of Ludlow: There is a lot of government rhetoric about areas where we have a strategic advantage or where we should aspire to be world-beating. How in the present advisory structure will you get the optimal advice in how to choose which those areas should be?

George Freeman MP: That is a predictably excellent question. There are two parts to that. One is science advice and technology advice on the state of that particular science or technology internationally and an honest appraisal of where we are strong rather than telling ourselves where we want to be strong. The first part is making sure we have that peer-reviewed, rigorous analysis. There are various bodies for that: the Council for Science and Technology, the OSTS itself and the advisory groups put together by both the team and me in BEIS and the other departments.

The second piece is the commercial insight into competition because of course we are in a global race with other countries investing aggressively and companies being formed.

I will give you, if I may, Lord Rees, a good example of this. At the NSTC's last meeting, the Secretary of State and I agreed to table a paper on what the UK's strategic science and technology policy on quantum should be. That work is going on now. We are asking world-leading quantum scientists and quantum science experts where the best practice is and who is doing what.

But I am adamant that we also have to ask world-leading companies and investors who is making the bigger moves, where we fit in and what the UK's real advantage is. The best way I can describe it is with a Venn diagram. I am hunting like a truffle hound for areas where, in the science leaders' opinions, we genuinely are world-class that are also areas where investors are hungry. We have to have both.

That is the work that Alex and I and the team are putting in place with Patrick Vallance and that architecture we talked about earlier.

Lord Rees of Ludlow: To follow up, where do you think the R&D needs to be done? I think we all agree that the universities need to cover a wide range and have a watching brief over innovations anywhere in the world so we can pick them up and run with them, but we want a special effort into those that are the Government's priorities. In that context, what do you see as the role of public sector research establishments with a focused mission?

George Freeman MP: Yes, these are questions we are literally in the process of asking ourselves now as part of the ecosystem review. I will perhaps pass to Alex in a minute to flesh out some of that public sector laboratory piece.

We are conscious that the UKRI reviews—the Grant review, the Tickell review and the Paul Nurse review—are all timed to come in at the same time now, at the beginning of this big step up in funding, and will ask

those questions. What is the right balance in our funding mix between the deep blue sky, the long-term funding, the block funding, the experimental blue sky, the deep strategic technologies that have been identified as being of interest, the near market and the commercial? As you know better than anyone, that is not a straightforward question to answer, but it is important.

Quantum is a bad example because I have not yet had the advice but let me take a sector I know better. If in life sciences the advice is that, post-pandemic, the scale of change in pathogen genomics and the ability to detect and sequence plant, animal and human pathogens quickly means that we have a strategic advantage in terms of biosecurity, the UK could build off the pandemic and build strategic proprietary expertise, harnessing expertise at Porton Down and the Jenner Institute. We do not at the moment have a research council for biosecurity but we have huge strengths in the BBSRC, in the MRC and in some of the other research councils.

I am at this moment, as part of the UKRI strategy, asking whether we can make sure that, as well as support for deep silos of excellence in established fields, we create the space to be able to bring public labs, universities and research councils together around emerging strategic priorities.

Lord Rees of Ludlow: Thank you. Would Alexandra Jones like to add a bit to that?

The Chair: Would you keep it brief, please, Alex?

Alexandra Jones: Yes, of course. The public sector research establishments are a huge asset to the UK. As the Minister said, the landscape review will look at how we make the most of them, particularly because they have quite focused missions, which creates an advantage in working with them on particular issues. NPL on measurement is also doing interesting things, not just on the science but with businesses right around the country. It stems from the deep research through to innovation. We have a huge opportunity to make more of them. We are looking at that and working with the Government Office for Science. I believe Patrick Vallance was talking about that as well.

Q85 **Baroness Rock:** Minister, thank you. You have talked about having a full global impact, but you have also talked about us being in a global race, so there is a balance between competition and collaboration, particularly in areas like space, satellites and nuclear fusion. Have the Government identified where we should collaborate and where we should compete with other countries? Perhaps you could give some examples of that.

In the interests of time, to add a supplementary to that, we have in this inquiry heard concerns about the damage caused by the failure to associate with Horizon Europe. Is the UK still perceived as an attractive partner for scientific collaboration?

George Freeman MP: Thank you, Baroness Rock. I will take them both and then perhaps ask Alex to add on.

On the collaborate-or-compete question, they are not mutually exclusive but, to be credible, one has to be clear about where one is collaborating and where one is competing. Those boundaries will be different in different sectors.

Let me take up your invitation to bring it alive with an example. We have a £16 billion UK space sector. It is nascent but it contains some world-class small companies and some bigger companies. We are looking to build an integrated, competitive, open, global space sector. We are members of ESA. We put in £400 million a year. We are the third biggest contributor. We see ESA as a very powerful forum for broader, small E, non-EU European nations, Israel, Switzerland, ourselves and Norway, including the EU nations. Similarly, ITER is the great global collaboration for taking fusion to an industrial scale. These bedrock foundational collaborations are fundamental if we want to share economies of scale, share best practice and accelerate our pursuit of progress.

But it is perfectly possible as well—indeed, it is my duty as UK Minister—to say that as part of ESA we also have our own strategy, as the French and the Germans and others successfully do, and we want our membership to support it. We have not really done that much or as much as we could do in the last few years. I relish the challenge.

Actually, without wanting to unpick the difficulties of our membership of the EU, it might help the whole process if we were a bit clearer. With ESA, I am clear that we are not trying to build our own Airbus or build our own equatorial launch mission. We would like through our membership of ESA to grow the UK as a centre for regulatory leadership—we can move a bit more quickly than the EU—linked to insurance, to make the UK the best place to license low earth orbit satellites and to use our LEO satellite constellation to help our European space economy on our doorstep to grow. We can have that conversation. It is both collaborative at core research level and clear about where we try to build our unique strengths. One can do that across the board.

On Horizon, you have heard me say on record often that the Government's policy continues to be that we want to associate. We negotiated that carefully in the trade and co-operation agreement—TCA—and 15-odd months on we are frustrated. We understand but we do want to associate. We are pushing hard and hoping that geopolitical events, from the Irish elections and the French elections to the Ukraine situation, may create a thaw. That remains the Government's policy.

But we have also been clear that we cannot allow a situation where uncertainty and/or being blocked damages UK science and research today. That is why I have launched the first guarantee of funding for so-called in-flight applications that have been through the first process. We set up in December to guarantee funding and have extended that to the end of the year to give those teams working on Horizon applications the knowledge that they will not be left hanging off a cliff and we will fund them.

Also, we need a so-called plan B for what we will do if, regrettably, we are not able to associate. I will not take up too much of the committee's

time, Lord Krebs, doing it in detail and I will happily write offline. But essentially, we spent a lot of time in October, November and December listening to the science community. What is so fundamentally valuable about Horizon? The message was clear: the fellowships are hugely valued and, secondly, it is the familiarity across Europe of terms. When you speak to researchers in other universities, they say, "It is a Horizon project. We know how that works." Plan B is basically to take what is known and loved by the research community today and make sure that it is there.

The first three pillars will be the three pillars that everyone is familiar with. The first is the talent. I have suggested that if we have to do our own, we put more into the talent pillar than we have traditionally, and we make them slightly longer term and base them on the Wellcome and some of our academy fellowships in a big UK programme of global fellowships.

The second is the industrial pillar. I would that argue that the industrial involvement of UK companies has been quite low. If we frame those around industrial challenges, we could get more money in from industry.

On the innovation pillar, again, UK entrepreneurial, company and VC investor engagement has been quite low, because it is an academic programme. We could do that better and get more engagement.

Then we have three new pillars around much bigger global—beyond Europe—engagement, bilateral and multilateral; much bigger commitment to global challenges; and lastly, sectors that are currently precluded like space.

Those are my thoughts on plan B, but Alex may want to pick up particularly on the first point about collaboration and competition.

Alexandra Jones: Simply to echo that the "own, access, collaborate" framework that the integrated review set out is a way of thinking about where we try to major in it ourselves and where we need to collaborate. There are examples like fusion where we need to collaborate but there are some areas where we can specialise and grow our own industries. Taking the decisions about what you do and which ones you do at scale will be part of the NSTC and so on.

You also asked whether the UK is still an attractive international partner. If we look at the figures for international investment, we see that we still have particularly high R&D investment from overseas, for example. Our universities are in the top 10 in the world regularly and that is not just on research but on things like spinouts. We can see that talent continues to come here. Yes, I think we are an attractive partner.

The Minister spoke about how we make sure the world knows fully all the jewels we have here, including the public sector research establishments, to make sure we can continue to attract investment and attract the talent that makes the most of the UK.

George Freeman MP: The three—Horizon, Copernicus and Euratom—have traditionally gone together. I have set out a plan B for Horizon. We

could do it. The one I am most worried about is Euratom, where I am not sure there is an easy plan B. We are so at the collaborative phase through ETA that I think, if we were out of Euratom, our fusion programme would suffer and ETA would suffer. To your point, I do not suggest it is easy everywhere.

The Chair: Thank you very much. I need to press on because we are rapidly running out of time. I would like to turn to Baroness Blackwood.

Q86 **Baroness Blackwood of North Oxford:** Thank you, Lord Chair. First, I strongly agree on Euratom.

But to move on, through the discussions we have had, the need to strengthen academic and industry partnerships to stimulate scaling of innovation has run like a thread. You have mentioned a few steps that have been taken such as catapults and so on, but what do you propose as your agenda for encouraging that movement back and forth and those collaborations for that purpose?

Secondly, we have heard conflicting views on whether the balance is right on IP at the moment and whether it is helping or hindering. Do we have it right at the moment? If not, what steps would you take?

George Freeman MP: Thank you. I will try to keep my answers short. Specific things on this—

The Chair: Saved by the bell. Could we pause for a moment?

Committee suspended for a Division in the House.

The Chair: Welcome back and I invite Minister Freeman to continue with the comments he was about to make.

George Freeman MP: Thank you, Baroness Blackwood. Your two questions were on academic industry partnerships and IP.

How do we strengthen, catalyse and make it easier to create those partnerships? We are thinking of it in several parts.

The first is the career part. There is something to be done in career pathways. I meet a lot of scientists on trips, young scientists these days, who expect to have a go at innovation in the course of their career in a way that—dare I say it—my generation perhaps did not. You were the exception if you went that way. The culture has changed, and we need to reflect that in career structures so that it is not such a difficult choice to have a go at innovation without losing your status as an academic.

Secondly, the catapults are our clutch plate for deep industrial R&D engagement with our public R&D. We are in the process of not another review—we do not need another review—but a refresh led by Innovate UK and the Catapult Network around how we learn from best practice and those who perform best and tighten up that structure.

Thirdly, Innovate UK is leading on delivering the innovation strategy. Some of the missions that we set out there were designed to catalyse

quite agile private-public partnerships in pursuit of key strategic priorities.

I would not be doing my job if I did not mention as well that one has to look at the REF incentives. One tends to get in government that which you incentivise, consciously or unconsciously. Perhaps Alex can touch a little bit on where we are in this process, but my overall sense is that we are slightly playing one-club golf. We have incentivised a set of behaviours and the universities have responded, but we need a slightly more mixed ecosystem that is more rewarding for deep expertise, more rewarding for agile, multidisciplinary research and more rewarding of that engagement with industry that we want to see, without undermining our support for core blue-sky or non-economic.

IP is the other one that I would flag. To answer your question specifically, having lost most of my hair negotiating IP agreements around universities, I have watched the sector go from the 1970s model, where traditionally one person was in charge of IP, normally within sight of the bursar's office, through the tech transfer boom of the 1990s, when a lot of our universities established quite strong numbers in quite sophisticated tech transfer offices. Of course, they then become cost centres and quite a lot of universities then require them to get a quick return. Talking to people around the UK system now, I hear some say, "Some universities are very relaxed and not sure they're getting full value. Others are very aggressive and we waste far too much time trying to negotiate endlessly long agreements up front."

The system is not perfect, to answer your question. I am thinking at this moment about how we can most easily and quickly help best practice to flourish. I am interested in any thoughts from the committee on that. Alex, perhaps you could comment on that and on the partnerships point.

Alexandra Jones: Of course. We have the Intellectual Property Office giving us some advice on this, but we are looking at what we can learn from the States, for example, which is often cited on this. How can we ensure that the way we approach this creates the right incentives and makes the most of the research? We are looking at that with help from the IPO and we are looking overseas as well.

On the incentives more generally and encouraging some of those academic and industrial partnerships, we have the results of the 2021 REF coming out in two months, this May. Also we are doing a future research assessment programme to look at how we reform this, how we make it less bureaucratic and how we make sure we focus more on impacts. There is some work on those incentives.

There are other programmes as well. The Connecting Capability Fund, for which we announced a further £25 million in the innovation strategy, has help set up Northern Gritstone, which is Manchester, Leeds and Sheffield working together to set up a £500 million investment fund. Interesting partnerships such as Innovation to Commercialisation of University Research—or ICURE—have programmes designed using a start-up methodology to try to get people thinking about commercialisation and getting a product closer to market.

We are looking, as the Minister said, at how to encourage individuals to move between academia and business and back again and for that to be regarded as a good thing, as opposed to it not being regarded well in either academic or business circles.

The UK RPIF is also interesting, with programmes of work where we jointly invest with business. It has to be £2 of non-public funding for every £1 of public to create new facilities and infrastructure.

There is a range of ways we can provide incentives to create the relationships, the kit or the ways of working and training people to do some of this. We are looking at a number of those, as well as creating a culture in which this is seen as a good thing and genuinely incentivised. There is more to do but there are some good programmes we can build on. That is what we are looking to do. As well as creating new things, it is actually about making the most of what works.

Baroness Blackwood of North Oxford: Thank you. I have a tiny supplementary. With all that in place, there is often a gap with management teams being available for the companies which are spun off from universities. Are you looking at how to create incentives to attract the right-quality management teams for those companies so that we can scale quicker?

George Freeman MP: Yes, as part of the scale-up work, we have looked closely at what the Scale-Up Taskforce has been recommending here. This links to your question about IP as well. We want to understand the barriers. What is stopping great managers from coming to join our ecosystem and pull through? There is a whole raft of things there but there is definitely something around the process of tech transfer out of universities being variable and sometimes very slow and sometimes faster. My personal instinct is, if we were looking for a simple indicator, it would be time. How long does it take to get an intellectual property agreement signed? In a way, that is probably the key metric.

The evidence from investors we talk to is that this old problem, that we did not have enough management talent, is getting a lot better. As we recycle and companies sell, we generate and recycle talent more and more. But we need to think about developing people from different sectors. As we see sector convergence, as we see functional foods, nutraceuticals, medicines and nutrition merging, as we see AI and healthcare merging, that also creates an interesting opportunity to bring people from different sectors and develop a cohort of people from the UK. We are thinking about fellowships in that space as part of my flagship fellowship programme. Could we support and nurture a cadre of young, talented innovators and innovator managers to come to the UK?

The Chair: Thank you very much. I would like to press on now and turn to Baroness Sheehan.

Q87 **Baroness Sheehan:** Minister, what policy levers do the Government have at their disposal to incentivise private investment in R&D?

George Freeman MP: Several. If one takes it from the top down, the big volumes of money we have been missing are in scale-up City finance. I mentioned earlier working with the Chancellor on changing the rules on institutional pension funds so they can invest—various rules put in place after the last crash have inadvertently meant that has been difficult if not impossible. That is the first thing. Unlocking that significant pension funding ecosystem will deliver significant funding.

Coming back downstream a bit, for the ability to finance and float scale-ups here—again, the ScaleUp Institute has done some good work on this—you need enough volume to generate liquidity and to maintain and justify analysts. One piece of work I have started is to look back through our high-growth sector and see how many companies we have coming that look as though they are on track to raise the sort of money you could raise in London. If we could tell the investor community what is coming, it would go a long way to giving some confidence.

Coming back downstream a little bit, on the Innovate UK suite of programmes, there are too many to mention. That is partly a credit to Innovate UK's creativity, but it is a problem unless we have quite a strong and consistent offer and people know what they are getting. I am working with Innovate UK on how we might make that landscape a bit more coherent and clearer to people.

When I was investing, we had the Smart award—the basic, minimum, largest—and the SBRI programme. We want to try to build on programmes that we know work well. As we come downstream towards the nearer research interface and the points that we have been talking about such as making the careers easier, I would like to think we could get some of these fellowships in the commercialisation space sponsored. If we could start to get companies interested in, say, quantum, we could have some quantum fellowships. Those in themselves could both nurture talent and create a stronger interface between companies in the sector and people interested in it. Alex may be able to give you a more detailed run through of specific programmes if you want it.

Baroness Sheehan: No. I would like to press you further on confidence. Businesses need confidence if they are to commit long-term funding or personnel, even. How would the regulatory framework feed into that?

George Freeman MP: I should have mentioned the R&D tax credits, which are a key part of it. I have signalled to the Treasury that if we really are to unlock the £100 billion over the next six years to get us to 2.4%, one key lever is R&D tax credits. We need to think about how best to deploy them as part of it. Sorry, you mentioned the other specific—

Baroness Sheehan: I was talking about regulatory. How important is alignment internationally? You talked at the outset a lot about science being a force for good, particularly on the international stage.

George Freeman MP: Yes, as I set out in this report for the Prime Minister last year called the Taskforce on Innovation, Growth and Regulatory Reform, hence the energetic acronym TIGRR, I made the case that in all big established sectors, continuity both post-Brexit and more

broadly globally and having standard regulatory frameworks is absolutely key if we are to unlock the levels of investment we need.

Equally, it is true that as the UK looks for a USP in an increasingly global market, I can see a strong opportunity for us to be more of a global digital testbed for the technologies of tomorrow, particularly in circumstances where, with the best will in the world, we may not be able to deploy Chinese or American levels of public sector procurement or even infrastructure funding on the sort of scale that we see. Playing to our strengths, we have a huge opportunity to be the agile digital testbed; for example, for the medicines of tomorrow, so that companies come here to get the excellence of NICE's health economic framework, collect data on population health and build on that clinical trials piece, without necessarily needing to see upfront an NHS commitment to procure. They come here to generate the data. Similarly, on autonomous vehicles, rather than legislating for autonomous vehicles to be licensed everywhere, we need to look at creating some testbeds in digitally nominated places where we gather the data and build the expertise. That is true across a number of sectors. If we then use our freedom outside the EU to help lead the way to what digital, genomic, phenotypic drug regulation looks like in the next phase or to what satellite launch regulation looks like, we could strike a blow for both UK competitiveness and global regulatory leadership.

The Chair: Thank you. We are due to run out of time but I wonder whether, Minister Freeman, you would be prepared to stay with us for another 10 minutes or so to complete the questions.

George Freeman MP: Yes, by all means. I would be delighted. I had better check that I am not supposed to be next door. No, I am fine.

The Chair: Thank you very much. Baroness Walmsley, I think your question about regulatory alignment has been answered, but is there a small additional point you would like to add?

Baroness Walmsley: Not all of it, but it is about regulation. When dealing with other countries, how do you decide when to align and when to diverge?

George Freeman MP: First, there is no golden rule. I have tried to set out the principles. Where you have an established major industrial base—the automotive sector, the aerospace sector, the life sciences sector—it is pretty important on day one, in a situation where you leave the EU or leave any other international bloc, that you try as far as possible to limit damage. My instincts are strongly for convergence on day one.

But to develop competitive advantage, it is important as well to identify areas where we as the UK may have an opportunity to move more quickly and be more agile.

Those are the principles of it. I could go through the different sectors if you like but I hope that is clear in terms of principles.

Baroness Walmsley: I do not think we have time for that, unfortunately. Is it realistic to expect other countries to follow standards

set in the UK, even where we are good at it?

George Freeman MP: Yes, I believe so. If you take the sector I know best, the life sciences sector—and obviously Baroness Blackwood is our in-house resident as chair of Genomics England—the scale of change that genomics and informatics is bringing to the process of drug discovery is totally transformational. The old model of biological random target identification used deep scientific insight, then combinatorial chemistry and then all of the 15-year \$2 billion 80% failure rate to develop a molecule to work in humans with disease. Genomics and informatics mean we are able to start with patients, their blood, their tissues and their disease in real time and in real life and, with their consent through research charities, take out a huge amount of cost, risk and time in that process and work much more with patients to get them the right drugs. Many of the drugs that have “failed” are dream drugs if they are given only to the right patients. It is about reprofiling and also about driving enlightened stratified medicine and drug discovery.

That is also a profound change for the regulatory framework. Regulators then are not regulating on the basis of one size fits all. “Should we approve this drug? It does not work in everybody. It has minor side-effects. It is optimal for these people.” That is a huge change that in the UK we should be aspiring to help define for the world. We have in the MHRA the world’s greatest regulator, the genomics and the informatics. In GEL we have the world’s most advanced developer of genetic medicine. That is transformational.

It would be a disaster both for global genomics and for the UK if we were to say, “No, we’re going to drop any ambition to lead in that. We’ll just be good members of the EMA.” I think the EMA in a few years will come to us and say, “Very interesting how you’ve really pushed ahead. Could we start to work with you more closely, because we’d like to adopt that across the European system?” I genuinely think that is doable.

Q88 Lord Patel: Good afternoon, Minister. Being pedantic before I ask my question, it is not medicine that is stratified; it is the patients who are stratified for the medicine that we hope will happen.

To go to my brief question, what role do you see ARIA playing in developing a science and technology strategy? Can you update us on where we are with establishing ARIA now that the Bill has received Royal Assent?

George Freeman MP: Thank you, Lord Patel. Yes, I am aware that it is the patients who are stratified. I was using the phrase “stratified medicine” to signal what happens to medicine when you have the ability to stratify patients, but the point is well made.

On ARIA, you will have seen that the Bill has completed its passage through both Houses and has received Royal Assent. It is not for me but perhaps I could thank all of you. Many of you in this committee have been involved in helping to get the Bill right.

As you know, the whole genesis of this project that I have inherited is that it should not be subject to the usual interference and political whimsy of the Minister of the day. It has been set up to be free of political interference. The Permanent Secretary at BEIS is the senior accounting officer responsible for it and the Secretary of State and I are responsible for those responsibilities that sit with BEIS, which are effectively to make sure that it is properly set up, has robust accounting procedures and in the framework agreement has robust organisational procedures. But it will not be for me to decide what the research programmes are—just to repeat that.

We are in the process of recruiting for both CEO and chair. You can imagine that various skills have to be covered by both parties. One could do it in different ways. One could have a CEO who is an experienced old hand at setting up these sorts of projects who then sets it up and then hands it on to perhaps a younger, more dynamic science CEO. Or one could have a more experienced chair who leans perhaps more heavily on the setting up piece and hires a CEO who goes around the world to recruit, find the best people and decide the programmes.

Peter Highnam, ex-deputy director at DARPA, has been working with us and has signalled that, for family reasons, he is unable to take on the full-time CEO role, but I am delighted to say that he is absolutely keen to continue working with us to frame and support the CEO and the chair in learning the lessons from DARPA. We hope and intend to have both those roles confirmed as soon as possible—the chair role is now slightly ahead of the CEO role—within a matter of a few months. Certainly, this summer, our aim would be to have those two people in place so that we can crack on.

The Chair: Thank you very much. I would like to turn to Baroness Manningham-Buller for a final question.

Q89 Baroness Manningham-Buller: We have heard quite regularly during this inquiry of a concern that things run out and the scientists do not have long enough to plan. There is frequent change, new ideas and new initiatives. How can we make this as far as possible long term, given changes of government?

George Freeman MP: If I may, it was an incredibly important point I made at the beginning that this community has suffered a lot of insecurity and volatility in the last few years. My first job is to give that sense of security.

Let me hand over to Alex but, from my point of view, there are three key things. One is politically to give a strong signal that this is 10-year plan and big, strategic change and we do not intend to tinker with lots of endless initiatives. We want to get the structure right, the ecosystem for science superpower, global geopolitical leadership and innovation nation and then stick with it, as we did with the life science strategy.

The second piece of the continuity is to try to signal the public funding trajectory, as the Chancellor has tried to do, over three years, but he has also signalled that we will go to £22 billion in 2027.

The next key thing is to show that we are absolutely committed to delivering that deep industrial engagement because that is how we get to the £100 billion and the 2.4%.

Baroness Manningham-Buller: One of the reasons we started this inquiry—and there were several—was because there seemed to be a proliferation of inquiries and reviews and reviews and inquiries. There was a whole range of them; I cannot remember most of them. That presumably has caused some anxiety to the community about what will come out of those reviews and whether they will fit with the three things you have said.

George Freeman MP: Yes, I totally accept that. My ambition is that this summer the three reviews of UKRI—the Grant, the Tickell, and the Nurse reviews—will have landed and will have been adopted to the extent necessary as part of the three-year funding settlement. UKRI will be able to breathe and it will have its three-year money. You would expect in these first few months after the CSR, as I effectively hand over £26 billion on behalf of the public, for there to be some quite robust conversations about how UKRI becomes that Formula 1 engine and the most agile institute. That is quite hard work and I totally understand that for scientists who just want it to work and want to be allowed get on it is frustrating. But it is important. Once we have done it, my ambition is that, in three years, people say, “Phew. We’ve had some stability. It’s clear. Everyone knows what they are doing.”

I know it is not this committee’s job, but I observe that it would be helpful to have a Science Minister stay longer than a year in post, which would help with some continuity.

Baroness Manningham-Buller: That is not in our competence.

George Freeman MP: Nor mine.

Baroness Manningham-Buller: But I think we would agree with that. The three years for UKRI is rather different from the decade. Again, I hope you will look at that.

George Freeman MP: Yes. As part of Horizon, I am talking to the Chancellor. This round of Horizon funding will be a £15 billion commitment over 10 years, which we pay in up front and then get back over the course of the full period. The Chancellor has signalled that he has made that commitment to international science and to UK science for international purposes. There may be an opportunity there to make sure that there is much longer-term funding security. I hear you loud and clear.

The Chair: Thank you very much indeed and thank you, Minister, for your helpful comments to us this morning and to Alex Jones as well. I certainly echo the call to have longer-serving Science Ministers. We seem to get through them at a rate of knots and I hope that changes. Thank you very much for giving us evidence today.

As I said at the start, feel free to submit any additional points in writing if you wish to. I think you mentioned that you may be able to add a bit

more detail about the Horizon programme. If you had any thoughts about Digital Europe, which I think we will not be part of, it would be interesting to hear them in writing. Of course, you will receive a transcript for minor corrections if you wish to make them. We will carry on with our inquiry on the basis of the evidence you have given us today. That was kind of you. Thank you.

George Freeman MP: Thank you, Lord Krebs and the Committee.