

# Science and Technology Committee

## Oral evidence: R&D Investment, HC 785

Wednesday 20 October 2021

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Members present: Greg Clark (Chair); Aaron Bell; Dawn Butler; Chris Clarkson; Rebecca Long Bailey; Carol Monaghan; Graham Stringer.

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### Witnesses

**I:** Sir John Kingman, former Chair, UK Research and Innovation; and Professor Dame Nancy Rothwell, President and Vice-Chancellor, University of Manchester.

**II:** Sir Paul Nurse, 2001 winner, Nobel Prize in Physiology or Medicine; and Professor Sir Peter Ratcliffe, 2019 winner, Nobel Prize in Physiology or Medicine.

**III:** Sir Adrian Smith, President, Royal Society; Sir Andrew Mackenzie, Chair, UK Research and Innovation; and Lord Browne of Madingley, Co-Chair, Prime Minister's Council for Science and Technology.



## Examination of witnesses

Witnesses: Sir John Kingman and Professor Dame Nancy Rothwell.

**Q1 Chair:** The Science and Technology Committee is taking evidence today, a week before the Budget, in response to concerns that have been expressed over reports that the Government are minded to reduce their commitment to investment in science and technology. In the 2019 manifesto, in the Queen's Speech and at the March 2020 Budget, the Government set out plans to increase public R&D spending to £22 billion a year by 2024-25. However, the innovation strategy published this summer dropped that year attached to the commitment, and the Committee's correspondence with the Secretary of State, asking if this was deliberate, has not answered the question. In today's session, we will consider the implications of such a departure from the previous commitment.

We are pleased to welcome as witnesses the former and new chairs of UK Research and Innovation, the vice-chancellor of the University of Manchester, two Nobel prize winners, the president of the Royal Society, and the chair of the Prime Minister's Council for Science and Technology. I am very pleased to introduce our first two witnesses: Sir John Kingman, the chair of UKRI until summer 2021; and Professor Dame Nancy Rothwell, president and vice-chancellor of the University of Manchester and chair of the Russell Group of Universities. Thank you, Sir John and Dame Nancy, for joining us.

Perhaps I can start with a question initially to Sir John. You gave a speech in July of this year to the British Academy reflecting on your time as UKRI chair, and in it you talked about future science funding. You said that the £22 billion figure sometimes appears with the date 2024-25 and sometimes without, but that "it is a number that offers plentiful scope for definitional jiggery-pokery...My blunt advice to those who care about research funding is to take nothing at all for granted. And to focus on real decisions and real budgets, not medium-term promises." Can you just advise the Committee about what gives you cause for concern about the reliability of the commitments?

**Sir John Kingman:** First of all I should emphasise that, as you say, I stepped down from the chair role a few months ago, so I am no longer part of decision making and I have no inside information at all about what is going on in relation to next week's Budget. Very simply, the Government are clearly under enormous fiscal pressures on every front, and therefore, quite rightly and understandably, R&D has to compete with many other extremely good calls on public funds.

The other thing the Committee needs to be aware of—as you say, I broached this in my speech—is that it would surprise me a lot if the Government do not announce some big number next week for R&D. It might not be £22 billion—I have no idea—but whatever the number is, it will be incredibly important to be very precise about what is in that number and what is not in it. There are all sorts of layers to that that I



think are worth bearing in mind. I am more than happy to talk to you about them, but I do not know at how much length you would like me to answer.

**Q2 Chair:** Do expand on that a bit. Tell us why it is important that there is such clarity around it. What are the components that need to be clear and why it is important that they should be?

**Sir John Kingman:** First, it is important to remember that this is a whole of Government number, which is a good thing. Lots of outstanding work is funded through UKRI, but there are also very important research activities funded elsewhere by the Government, so I think it is good that it is an all-Government number. It will need to include the growing wedge of cost of our participation in the European research programmes, which is quite a significant number now, and of course that is an additional cost that we did not have to bear before, so that is important in comparing apples with apples.

There are other things worth bearing in mind. The non-UKRI parts of the budget—Government Departments' R&D spend—cover some very important areas: health, security, defence, net zero and so on. Those programmes should make an important contribution, but it is also worth bearing in mind that other Departments are under enormous financial pressure, and whether they spend that money on research is ultimately a matter of political choice down the track. The sad truth is that, other than Health, other Departments have tended to look to their research budgets as a sort of soft underbelly that they have had to raid when times are tough.

I think that the key thing for many in the scientific community will be stripping away many of these very good and important aspects in order to understand the implications for the core funding of the research base, particularly through the research councils and through the QR system. That budget has been held very tight for a very long time now. Essentially, the research councils, which are the sort of bedrock of the system, have been held at flat-cash for basically a decade—they have been cut in real terms. Money has been spent on some really good additional things over and above that, but that is the stuff that really matters and the foundation for the future. If you look at why we have the Oxford vaccine, that depends on masses of work over many years, funded through core funding routes that were not glamorous at the time. That is what I would urge the Committee to take a close interest in when dissecting whatever announcements are made next week.

**Q3 Chair:** Thank you, Sir John. Just a question of clarification before I go to Dame Nancy. You said that it is a whole of Government R&D number, and that therefore research money may be allocated to Departments, but were you implying that it could be allocated to Departments, or set against Departments, but then re-allocated by those Departments away from research during the years ahead?

**Sir John Kingman:** Yes, absolutely that is one possibility. Another



possibility is that there are good intentions to create new programmes, but they never quite get off the ground or they get off the ground much slower than the Government might hope. A good example—actually, a very high-profile example—would be ARIA, which has been this big plan for the Boris Johnson Government. Yet here we are, a few years into the Boris Johnson Government, and it still has not even begun to happen. There will be other programmes of that kind—things that seem like a good idea and probably are a good idea—but, and this is not a political comment, the Government's track record of getting these things off the ground has tended to be slower than Ministers might hope.

**Q4 Chair:** A final question for you, Sir John. You talked about the overall shape of the budget and its allocation to Departments. How important should we take the specificity of years attached to sums to be? Is that important, or is an undated headline number sufficiently attractive?

**Sir John Kingman:** A headline number that is completely undated is no more than an aspiration. Maybe you cannot take the Treasury out of me, but what really matters is budgets. The Government have a tendency to put numbers out in speeches, press releases and so on that are not actually clear what years they attach to, or what their implications are for specific budgets. I hope that the Committee will take a close interest in burrowing into that.

If I could mention just one other point that might be an issue, there has been some suggestion that the Government might want to count the cost of R&D tax credits in this £22 billion. R&D tax credits are an incredibly important form of Government support for R&D, but I do not think when the Government announced the £22 billion, anyone thought that that number would be in. Also, whatever the currency is, it is very important to compare apples and apples, because the cost of the R&D tax credit is many billions now, so that makes an enormous difference.

**Q5 Chair:** But the point is that if R&D tax credits were to be included, they should be included in the baseline before.

**Sir John Kingman:** Correct, but I would also suggest that when the £22 billion was first mooted, no one thought that the cost of R&D tax credits was included in that number.

**Q6 Chair:** Dame Nancy, you have heard what Sir John has said. You have, I am sure, read or listened to his lecture on reflections. As someone who leads a research-intensive university, what is your perspective on the importance of the pipeline of research commitment?

**Professor Dame Nancy Rothwell:** I would absolutely share John's concerns and I also, like him, recognise the financial constraints. I think it depends on how you consider research and innovation. To me, it is not a cost; it is an investment. There is very, very good evidence that the returns are huge—at least £2 for every £1 invested leverage of private investment, much of that from overseas, and there is good evidence from Russell Group universities that every pound spent levers £9 for the economy. That means that from a spend of even an extra £7 billion, you



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lever over £60 billion—this is an investment. Even at 2.4%, we would still be below the OECD average. So we are not talking about leapfrogging ahead; some of our most successful competitors have three times more spend as a percentage of GDP on research and innovation.

There is one other point I would like to make, which I think is important. We talk about science and technology. I hope that we are considering that in its broadest sense, because there is much of the UK economy that is highly dependent on financial services on which research is very important—fintech, for example, and creative industries. So I am hoping that we are considering not just what many people would consider the nuts and bolts of science, technology and medicine, but the broader sense of research and innovation, which the UK is very good at in many areas.

**Q7 Chair:** Obviously one can speak in general terms about the importance of R&D, and indeed take a broad view of technology, but, from the perspective of the institution that you lead, are there any examples that you can give of where public funding could be fairly thought of as an investment that brought in matching private sector funding? Does it happen in reality?

**Professor Dame Nancy Rothwell:** Absolutely all the time, and I think universities have changed radically in the past 10 or 20 years. At one point we wanted to discover knowledge just for its own sake, which I should say is still important because without that you do not have anything to innovate or apply, but we now absolutely are looking at the commercialisation of start-ups.

Let me give two brief examples. John will know one of them extremely well in his role as chair of L&G, and it is the development of a £1.5 billion innovation district in the centre of Manchester. The second very obvious and often quoted example is the isolation of graphene, of which the latest development is a potential reduction in the amount of concrete that is needed for buildings by 30% by adding less than 1% of graphene—this is now being commercialised. This was a blue-skies discovery funded by the QR research that John told you about—not initially by competitive grants, but by small amounts of money that pump-primed. There are many, many examples like that across the country, such as the vaccines and DNA lasers. There are lots and lots of examples of real breakthroughs that the UK has made, thanks to blue-skies research and then following up with investment in innovation.

**Q8 Graham Stringer:** Obviously I am a Manchester loyalist, but I think at our recent visit to Manchester we were very impressed by the commercialisation of this, and the transfer of knowledge into the private sector and start-up businesses. What I have never been clear about—I probably should be as a member of this Committee—is how, as Manchester University and other universities have invited more and more overseas students, particularly Chinese students, that relates to universities' research budgets, especially as you only have to open any newspaper at the moment to see that the west's relations with China are



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changing. How dependent are our better universities on the investment coming from overseas and particularly from Chinese students? That is for Dame Nancy.

**Professor Dame Nancy Rothwell:** Thank you, Graham; good to see you. Yes, overly dependent. Currently, from Government funding, about 70% of full research costs are covered and the rest we make up. Of course, I would argue that makes us incredibly good value for money, but it does cause a risk, and not just from Chinese students but from international students generally. That was recognised last year as Covid struck and we thought that international students were not going to come—in the event they did—because it would have meant that research was under a huge threat, as we are making up that difference from other funds. So it is a risk.

Q9 **Graham Stringer:** Is the Russell Group of universities preparing a strategy to deal with that risk?

**Professor Dame Nancy Rothwell:** All are looking at diversifying international student recruitment. It has been dominated by a small number of countries and it has been helped recently by the Government changes in post-study work visas. India used to be very close in numbers to China for recruitment of students. It massively fell behind when the post-study work visa was abolished, but that has been reinstated and the numbers are slowly climbing back. We are all looking all the time at new markets, but we have very limited options. As I said, I can summarise most research-intensive universities in one sentence: on home students, if we are lucky we break even or lose a small amount of money; on international students and philanthropy, we make some margin that helps with the others; and on research we lose money.

Q10 **Graham Stringer:** Is it possible yet to assess what Covid has done to the numbers of Chinese and other students going to Russell Group universities? I know it takes some time to get registrations.

**Professor Dame Nancy Rothwell:** No. At present, speaking for the numbers at my own university for this year's entry, it looks positive, but I have not seen sector-wide yet. China is slightly down, but there is an increase in students coming from other major territories—India, USA, Malaysia and Hong Kong. Some of them are struggling to get here and some of them are doing study online, initially at least, for the first semester, but I have to say they have been very resourceful and many of them have got here. So at the present time that market appears to be holding up, but obviously it could be impacted if Covid continues to be a problem.

Q11 **Rebecca Long Bailey:** Thank you, Sir John and Dame Nancy, for speaking to us today. I will start with a very general question. Some experts have argued that the Government's road map lacks detail and poses more questions than it answers. What is your analysis and what further work do you think the Government need to do? First to Sir John.

**Sir John Kingman:** Thank you. I think there is no doubt that at a high



level, right at the top of the Government, the aspiration is unquestionably there that Britain's future is intertwined with the extraordinary strength of our science base and making more of that. I think there is a recognition, which is welcome, that that is not something that is not going to be free—it is something that has a financial cost and should be a priority for the Government. I think all the right noises have been made by all the right senior members of the Government. What we really do need, though, is clarity in our budgets going forward that enables everyone to plan. We are in a very long-term business, and this Committee has highlighted before the fact that budgets are often set very late, even for one financial year let alone several. That is the first thing.

I said in the talk that Greg kindly mentioned that the Government will also, to the extent it has money, have to make some very important choices about how that is spent and prioritised between the research councils and other forms of R&D. There will be geographic questions there around levelling up and so on, which I am sure we will come on to talk about. There is also a question about the balance between funding pure or basic research, for want of a better phrase, and funding commercialisation, applied work and engagement with industry.

My own view is that we have been incredibly strong at churning out wonderful, highly cited papers, but the perennial challenge for British science policy has been making more of that. We have, as Nancy said, made huge progress on that in recent years. I think the culture of universities really has changed around commercialisation and engaging with industry, which is incredibly welcome. UKRI has created in the last few years big programmes, in particular something called the Industrial Strategy Challenge Fund, on which several billion pounds has been spent. I think that is potentially the beginning of something very exciting.

Is that the sort of thing this Government will want to run with or not? The phrase “industrial strategy” is not quite as fashionable as it was, but that is not really the point. The question is: will the Government want to continue with that sort of engagement, which is particularly directed at partnership with industry? I very much hope so, but the Government have so far been silent on these questions.

Q12 **Rebecca Long Bailey:** Thank you, Sir John. Dame Nancy, the same question to you.

**Professor Dame Nancy Rothwell:** And a very similar answer. The devil is so often in the detail, but you need to get the strategy right first and then go on to the detail. But can I just reinforce something that John said? Research and innovation are not short-term endeavours. Often the real paybacks take quite a long time, particularly if we are—I very much hope we are—going to maintain the commitment to spending £22 billion by 2024-25. We need the people to do it and you do not train those people up very quickly. We need to expand now the number of people who can deliver on that, and then the number of people who can deliver on the innovation.



The UK is a relatively small but successful nation. There are not that many things we are world leaders in. Research is one, and if you look at it per pound spent, we are top in the world on various measures. I would agree with John that we have some way to go on the innovation, although we are actually getting a lot better at it. But not to support something where we are one of the best in the world would be unfortunate.

**Q13** **Rebecca Long Bailey:** Moving on to the issue of levelling up, one statistic that I found frankly staggering was that regional investment for R&D funding stood at around 61% for the south-east in 2019, so there is a clear contradiction between Government proposals to level up and what is happening on the ground. How do you think the Government should address this in the spending review?

**Professor Dame Nancy Rothwell:** It is somewhat more nuanced than that, as my colleague Richard Jones has analysed in great detail. If you look at public spending on R&D, there is a massive imbalance, with a huge proportion going to the south-east. If you look at private spend, it is somewhat skewed the other way, to regions like the one I am from and others that you might consider relevant to levelling up. The first thing I would say is: do not let us take money away from successful areas to fund areas that have been lagging behind—I do not think that is a sensible strategy. A key argument for lifting the R&D spend is that if you keep the same budget, that is the only way you can deliver that levelling up. For R&D, there are numerous clear global examples of where increased funding delivers jobs and prosperity, and not just for the big cities but for their regions, and that would be true across the UK. If there is an uplift, there is an opportunity.

John and I were just talking about a very successful scheme—the Strength in Places Fund. It is a tiny fund, but it is absolutely about universities working with local industry and other public bodies in the regions to deliver prosperity for those regions. An uplift in that would make a huge difference.

**Sir John Kingman:** I agree. It is a fact that the UK has a wholly disproportionate share of the world's greatest research-intensive universities. Some of those universities are highly concentrated in a small part of the south-east, such as Imperial College, UCL, LSE, Oxford and Cambridge. These are institutions that any country in the world, other than the US, would kill to have. For me, I think the clue is in the name: levelling up. UKRI could do masses more outside the south-east.

We have made a start. Nancy mentioned the Strength in Places Fund. I was very, very struck by the incredible quality of the proposals coming through that. Frankly, that fund could be many, many times the size and it would make some difference. The money from the Industrial Strategy Challenge Fund is spread very differently geographically from the way traditional public support for R&D is spread, because it involves engaging with industry around the country.



One way of thinking about this is to look at it the other way round and say to ourselves, “In so many cities, particularly in this country, a strong research-intensive university is probably their outstanding economic asset.” I am thinking of places such as Newcastle, Sheffield, Belfast and Glasgow—you could go on and on. Those institutions are fantastic and there is a lot of potential to invest in them. If you really want to make a difference to the economies of those places and the towns around them, that seems to me a very good place to start, but I am afraid we need the money.

**Professor Dame Nancy Rothwell:** Can I just add something? To me levelling up—obviously it is a key issue for me, being from the north of England—is not just about fairness. We are not going to lift the productivity and prosperity of the UK if we rely solely on one part of it. We have to bring other regions up towards those levels if the whole of the UK is going to succeed and the people across the UK are going to succeed.

Q14 **Rebecca Long Bailey:** I agree Dame Nancy.

One final question: during the pandemic the Committee was very concerned about the detrimental effect that the pandemic was having on the charitable medical research sector. Notwithstanding that, charitable medical research has historically received limited amounts of R&D funding. For example, funding for motor neurone disease projects totalled just £3.5 million in 2019 and 2020, despite it being one of the fastest moving biomedical sectors in the UK. Do you think the Government should address this funding gap in the spending review? First to Sir John.

**Sir John Kingman:** Nancy is the medic, so she will probably have more to say, but there is no question that this is a serious issue. We have looked at this the other way around. The UK has been unbelievably lucky to have very strong medical charities, led by the largest of them, the Wellcome Trust, which is an incredible institution. We are very, very lucky that Wellcome continues to spend completely disproportionate amounts in the UK, given the size of the economy. The Wellcome Trust has got through Covid in reasonable shape, but the others have been very badly hit.

I am not going to make a proposal, because I do not feel competent to and I am not up to date, having been disconnected from this world for a few months, but it is a serious issue and the reason there may be a role for Government is that traditionally the public funders, notably the MRC, have to some degree said, “Well, we do not have to do so much on, let’s say, heart disease, because we’ve got the British Heart Foundation,” but obviously, if the British Heart Foundation is under more pressure, there may well be—there probably is—a gap. But I defer to Nancy because she is a distinguished medical scientist.

**Professor Dame Nancy Rothwell:** I agree. We are very fortunate to have the medical charities, although they are disproportionate. Of course, apart from the Wellcome Trust, which is an endowment and a very



successful investment, the others are dependent on people giving.

Let me come back to something John said at the beginning. A really important part of the funding of medical charities is the Government additional fund that provides a partial match. It is called QR funding—quality research—and, as John said, that has been static for 10 years. That means that while we lose money as universities on grants we get from the Government, we lose even more money on the grants we get from charities, because that bit extra that Government puts in QR, as a block—every time we win a grant from a charity, we get a little bit of extra QR funding—has gone down and down. A simple way of helping those charities would be to lift that QR funding. QR just follows a formula as we get charity funding, so it is very non-bureaucratic. It is, “Okay, you’ve got a million pounds from this charity, so we’ll give you some extra money that helps with it.”

**Rebecca Long Bailey:** Thank you both. That is very helpful.

Q15 **Chair:** Just before I turn to Aaron Bell, Sir John, you said something that intrigued me. You said in characteristic self-deprecation that you are a bit out of date by a few months and that you did not have a current scheme in mind to resolve this, but I got the impression that you have had an idea on it, even though it may not be bang up to date.

**Sir John Kingman:** I am ashamed to tell you that I do not have an idea. There were certainly intensive discussions around this when I when I was at UKRI. I am sure there are things that one can do in this space, and I am sorry to be a broken record, but it does hinge on the overall outcome of the spending review, what the alternatives are and what the trade-off is. UKRI might have to make some very difficult choices. Whether there is money for this will depend on what the overall outcome is.

Q16 **Aaron Bell:** Thank you to both our witnesses. You both highlighted the strengths that we have in research. I think we have seen from the written evidence submitted in our Covid recovery inquiry that we are very good at the R and not so good at the D side of R&D. What do you both think is needed to improve the commercialisation of research in the UK? May I start with Sir John?

**Sir John Kingman:** I do want to say that this has been the perennial challenge for UK R&D Policy, but I do not want the Committee to have the impression that no progress has been made. I was involved in science funding in my time in the Treasury, going back to the 1990s. To me, there has been huge progress and the ultimate evidence for that is the number of very exciting companies that we are now seeing, many of which—not all—have their roots in various forms of public support, universities and so on. That is evidence of all sorts of previous policy drives to make a difference in this area actually starting to pay off.

The cultural barriers to this that were within the universities have been steadily broken down. That said, plainly we do not have a Silicon Valley or Boston or some of the really exciting things happening in some



countries around the world. For me, the most important intervention we have made to try and make a further step change in this area was this thing I keep mentioning, the Industrial Strategy Challenge Fund, which I ought to concede was really the brainchild of the Chairman of your Committee. It was a very good thing.

**Chair:** I like that, despite its provenance.

**Sir John Kingman:** We have been at this for a few years. So far we will have spent about £2 billion on it, which is quite a lot of public money for a completely new intervention in this space. What I think was encouraging about it was that in each of the rounds of it, there was both private industrial money and public money. Steadily, in the three rounds we held, the ratio of private money to public money grew. To me, this was real evidence that we were on to something here and that this model could fly.

The other thing that is interesting about that model and different from traditional British R&D support is that you do not just have a committee that looks at all the proposals in a given area and tries to find the best science. You have something called a challenge director, who is an individual who is empowered to think strategically about what the best projects are to support making a difference on that challenge. That is a different and, I think, exciting model. I very much hope that, whatever it is called, the Government will choose to continue with something like that programme.

**Aaron Bell:** Thank you, Sir John.

**Sir John Kingman:** But can I just emphasise one final point, if I may? None of this works if you do not have something to commercialise, and that is why you need to have the core bedrock support for R&D for all of that to build on.

Q17 **Aaron Bell:** This is a follow-up to you before I turn to Dame Nancy. Something like only 2% of UK firms claim R&D tax credits each year, so how do we get more firms to engage with the need for R&D in the first place, whether it is small improvements to the way they do their work, or major innovations and the sort of things that you are talking about with the challenge fund?

**Sir John Kingman:** I am not sure about that figure in itself, but it will always be nicer to see it being a bit higher. There will always be countless firms in the economy that are not involved in R&D. They are very small firms or in fields that are not R&D dependent. I do not know how different the figure would be in different countries. It is also important to remember that there is an issue that, compared with elsewhere, a much smaller share of the UK economy is manufacturing. Services and R&D is a much fuzzier thing. It is important, but it is harder, statistically, to capture and so these international comparisons are hard to interpret.

To make a difference, first of all we need the start-ups and we need them to grow, which means they need the availability of finance to grow. Then



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we need big companies around the world that have choices about where to do R&D to want to do their R&D in the UK. Those are different challenges. One of the reasons the R&D tax credit has a different arrangement for small companies and big companies is precisely that what you are trying to achieve in the two areas is a bit different.

**Q18 Aaron Bell:** Dame Nancy, from the university perspective, I assume you recognise what Sir John said—that there was perhaps a cultural aversion to commercialisation that is being overcome. Do you think there is still more work to do on that from the university side?

**Professor Dame Nancy Rothwell:** Of course we can always do better, but let me comment on two aspects from the universities' point of view. Academics are really good at responding to rewards and incentives, and we used to be wholly rewarded for publishing highly cited papers in the top journals. The Research Excellence Framework has shifted and, thanks to Research England, part of UKRI, they have recognised that it is not just publications but also impact. I have been a great supporter of that, and now impact makes up one fifth of the assessment. The same is true in universities, because we tend to follow where the funding is. We now reward academics for starting up a company as much as we do for their great discoveries, so I think it is the reward.

Another fund I want to mention, which is also part of QR, is HEIF—the Higher Education Innovation Fund. It is a small fund, but it is the one that helps to support us to pay for student entrepreneurs, start-up companies, the cost of patents and so on.

Universities and the UK are very good at start-up companies; we are not so good at scaling up. Too often, those companies get sold out, often overseas. This is about investment, and I think this is going to be private investment. OSI is a great example of where they brought in private investment. Just started now is Northern Gritstone, between the universities of Leeds, Manchester and Sheffield, which managed to raise £500 million for investment. Patient capital and start-up are important.

The other thing just briefly to mention is that we recognise certain risks around international students. A disproportionately high proportion of international students start up companies in the UK while they are here and then stay here, and we should recognise the importance of that. Secondly, when they go back to their home country, they are great ambassadors, when they later become industry leaders, for engaging with the UK. So please do not ever think of international students as just bringing in fees; they bring huge value to the UK and value in global trade as well.

**Q19 Aaron Bell:** You mentioned patient capital. Are there any tax changes to the treatment of venture capital, or something like that, that we need to consider to allow these companies more space to grow?

**Professor Dame Nancy Rothwell:** Yes, there are a number of tax changes that could be helpful. There has been discussion about pension funds investing more. If there were to be one tax change that would be



helpful, it would be the fact that universities pay VAT on any buildings that have more than 10% commercialisation in them. As an example, for one of our buildings, we won a competitive grant of £25 million and we are at risk of giving all that back in tax and VAT, which seems to me a bizarre way of money circling around the system, involving huge effort.

**Q20 Aaron Bell:** We are running a bit short on time, but I want briefly to ask you both about other changes to the R&D landscape, namely the new National Science and Technology Council and Office for Science and Technology Strategy, which is going to be led by Sir Patrick Vallance. First, would you say what roles you think they might play in improving R&D in the UK? Secondly, perhaps I could ask you to comment on Sir Patrick Vallance's comments in the press in response to our report that he thinks there should be essentially a Cabinet science Minister—a very powerful voice for science in the Cabinet. Is that something you would welcome? We will start with Dame Nancy.

**Professor Dame Nancy Rothwell:** I think this is a good thing, and I think the key role of this national council is to bring together Government Departments. John addressed this at the beginning. There are bits of R&D spend—some of them are quite big bits—that are independent and not joined up. I think if it is going to do one thing, it is joining up Government strategy across Departments, which has traditionally been a difficult thing.

I wholly agree about a Cabinet place. You can call it science, but I would call it research and innovation. I think that would be a very good message, not just internally, but internationally to R&D companies that might want to invest in the UK.

**Sir John Kingman:** I totally agree. This all needs to be joined up, and I think this is a very sensible way of doing it. I also think that if you go back to some of the things I was saying at the beginning about protecting R&D budgets, the council and this Whitehall wiring will be relevant, because it will happen.

When I was in the Treasury, it was a regular event that there would be an NHS funding crisis in the Department of Health and the first place they would look to find the money would be the billion-pound R&D budget of the Department. There would be a great political tussle over whether to protect that budget or not. The Government, I think, will probably, in allocating whatever big number it announces next week, put quite a lot into R&D budgets around Departments, and someone is going to need to be the guardian of making sure that it gets spent on R&D.

The other thing I would say is that there is only so far you can get with committees and drawings on bits of paper. In the end, this is about people and about whether senior decision takers in government really buy into this agenda. There has been a succession of science Ministers who have been big forces, whether or not they were in the Cabinet.

I would say that David Sainsbury, who strictly speaking was a rather junior Minister, had an enormous impact, partly because he was there for



a long time and he had the ear of the Prime Minister and the Chancellor. Similarly David Willetts and Dr Clark himself. I do not think whether Ministers are in the Cabinet is as important as how much clout they have in the real geography of Government and, in particular, whether they can get to the Prime Minister and the Chancellor when it really matters.

**Q21 Carol Monaghan:** Dame Nancy, can I go back to something you said just a minute ago about scale-up funding and foreign investment? We have seen over the last decade probably a huge number of particularly technology-based companies—I am thinking of areas such as quantum and photonics—attracting scale-up funding from countries such as China, for which this is small change. How do we realistically compete with that in order not to lose the benefits of these companies that are started in the UK?

**Professor Dame Nancy Rothwell:** This may not necessarily be Government funding. I think it is quite appropriate if it is private funding. You are right, there are very large funds and some sovereign wealth funds as well. I think diversification of those and the conditions of investment are particularly important.

Also, there is a lot of UK investment. I can probably say, whereas John would not, that L&G has invested very heavily in the research base in a number of parts of the UK—in Oxford and more recently in Manchester. I think if we can encourage more companies like L&G to invest, there will be huge returns. John may want to comment on that as it is his area.

**Sir John Kingman:** I am totally conflicted here because I chair Legal & General, which is Britain's largest institutional investor. As Nancy says, we have some very exciting investments in various venture capital funds, which are in turn invested in UK tech businesses, some of which are scaling up very nicely indeed. There is a business called Pod Point in which we have a material stake, which is about to have an IPO, and that is very exciting.

I am talking totally under my L&G hat here because I think that is the only thing I can do. The biggest thing the Government could do to make a further difference in this—and it is moving in the right direction already, I think—would be to unlock the enormous pool of defined contribution pension money. A tiny sliver of that going into technology capital would make a transforming difference. The Government are contemplating some rather techie changes to the rules around that. There is a very big opportunity there that I think the Government are alive to.

**Q22 Carol Monaghan:** Perhaps I can move on now to ask a couple of questions about international collaboration. We heard last year in the spending review that our official development assistance—ODA—money was going to be cut to 0.5% of GNI. We have also had some delays around the ratification of the agreement with Horizon Europe. Dame Nancy, how can the UK harness the full benefits of international collaboration when we consider the situation we are in at the moment?

**Professor Dame Nancy Rothwell:** International collaboration is



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incredibly important and it operates at different levels. There are big, big international programmes, and the UK is part of many of them, CERN being one as an example. I just feel we cannot even contemplate being a research nation or science superpower without being part of them.

Then there are the collaborations without which we could not make huge progress. Let us take the biggest issue coming up now—climate change and environmental sustainability. This calls for global collaboration. No nation can tackle it on its own; no university can even scratch the surface.

There are pressures on budgets, which is obviously going to be difficult, and the cut in the ODA budget was unfortunate. It hit research disproportionately, and there are many really good projects that got heavily cut. I am hoping that that budget will be reinstated.

Horizon is a question not just for us, but for the EU about association, and I understand at the moment that there are complications around it. But if that cannot happen, and I very much hope it can, we will have to find an alternative to drive international collaboration.

**Q23 Carol Monaghan:** Sir John, are there other things that the Government should be doing to maximise the benefit of international collaboration?

**Sir John Kingman:** I think the Government are very seized with this. In my view, they made the right decision about continued association with the European funding programmes. That is a decision that comes with a large financial bill, but I think the right choice was made in the circumstances.

I would echo what Nancy says about the very, very serious nature of the damage that has flowed from the choice that was made on overseas aid. It is very important to bear in mind that a lot of the research work that was funded through overseas aid was a massive benefit in the UK as well as in the developing world. Sarah Gilbert's work on the Oxford vaccine—I made the point in the talk that I gave—was built on years of work that had been funded under the overseas aid budget because it was thought to be relevant to viruses that might develop in the developing world. So we would not have the Oxford vaccine were it not for that funding stream. I do not think that that is too strong a statement. I hope that something can be salvaged in that area, but it is a big world out there. This is not about signing memorandums of understanding and all that sort of thing; it is about lots of concrete things where our scientists are collaborating with others around the world. Science is an inherently global enterprise.

**Q24 Carol Monaghan:** Do you think there was a proper understanding in government about the value of ODA and the far-reaching consequences of the cut?

**Sir John Kingman:** I know for certain that when the decision was taken, Ministers would have been given proper advice on the nature of the consequences, and certainly UKRI was giving very full advice. Clearly it



was a very major political decision, and I was not in the rooms where it was taken, but the right advice was certainly given.

**Q25 Carol Monaghan:** Dame Nancy, if I can change tack slightly, are the delays in ratifying the agreement with Horizon Europe causing any issues at the moment for UK R&D?

**Professor Dame Nancy Rothwell:** They are, because while there is uncertainty there is a reluctance to join programmes and a reluctance to put effort in. I have to say it is a huge effort to get European funding. It is quite a bureaucratic process, and quite understandably our staff are reluctant to spend that time if they are uncertain about the future. Similarly, European partners are reluctant to get British academics to join, because they do not know if we will be part of it. So as long as there is uncertainty, it is going to be damaging.

**Q26 Carol Monaghan:** Sir John, according to the Wellcome Trust, the cost for association was considered to be unrealistically low for the first year. Is there concern that other R&D funds might have to be diverted for future years to pay for association with Horizon?

**Sir John Kingman:** I do not feel able to comment on the financial issues, because it is very complex and it will have moved on since my time. But what is clear is that there is a net additional cost to the UK that flows from our no longer being a member of the EU. That money has to be found from somewhere. It seems to me, given the Government's aspirations for science, that that money should not be found at the expense of achieving all the things the Government want to achieve in the UK.

**Carol Monaghan:** Dame Nancy, I do not know if you want to make a final comment on that.

**Professor Dame Nancy Rothwell:** No, I would agree with that. Obviously there are issues beyond R&D about association. As a reflection of the strength of the UK, we should recognise that in the past we won far, far more for R&D funding than we ever put in—many times more. That was due to the quality of the applications. That has changed somewhat but, nevertheless, the value of that collaboration is still very much apparent.

**Q27 Chair:** Just to close where we started, in anticipation of the Budget and the spending review, both of you have talked about the importance of long-term commitments, and how science projects are almost always long term and require that continuity. But it is clear that the Government and the Treasury have a short-term problem. Covid has reduced revenues and we are borrowing more. Sir John, as an old Treasury hand, this would have fallen to you to resolve in years gone by. How would you resolve this conundrum?

**Sir John Kingman:** I do not have some magic solution, but I think that the pressure that this Committee has rightly brought to bear on giving budgetary clarity is a really important thing. If UKRI is given more



budgetary clarity, it will be able to spend money better. That is the simple fact. I do not know whether a UKRI budget will be announced next week. I slightly doubt it on past form. So when will UKRI get a budget that it can work on and for how many years will that be? That is an absolutely critical question.

A related matter in which the Committee may also want to take an interest is that there is a tendency to create lots of ringfences within the budget. This means that any major decision involves a very long delay while any flexibility in the ringfences is debated by Ministers. So the number of ringfences and whether they are needed is another topic that I would urge the Committee to take an interest in.

**Q28 Chair:** Finally, Dame Nancy, there is this commitment to £22 billion by 2024-25. If the Government were minded to say next week, "We're fully committed to £22 billion, but we've got a problem at the moment, and it will be at some point in the future that we can't quite say yet," what would your appraisal be?

**Professor Dame Nancy Rothwell:** I think, as John said, a commitment to spend without any date on it whatsoever—possibly beyond the current Parliament—would have limited value, and I think it would question our ability to even begin to become a science superpower or to deliver on levelling up. I think the date is really important, recognising of course the financial constraints. But I come back to what I said at the beginning. There is a difference between costs and investment, and sometimes, even in tough times, you have to invest in something that is going to pay back a lot more than you invest.

**Chair:** Dame Nancy and Sir John, we are very grateful for your evidence. It has been a terrific session, with very clear views vigorously expressed. Thank you very much indeed.

## Examination of witnesses

Witnesses: Sir Paul Nurse and Professor Sir Peter Ratcliffe.

**Q29 Chair:** Our next pair of witnesses, Sir Paul Nurse and Sir Peter Ratcliffe, now join us. I am pleased to say that they are here in person and have been in attendance to listen to that first session. It was very good of you both to come early to be able to do that.

Let me formally introduce both of you to the Committee. Sir Paul Nurse is director of the Francis Crick Institute and was the 2001 winner of the Nobel prize for physiology or medicine. His colleague, Sir Peter Ratcliffe, is clinical director of the Crick and was winner of the same Nobel prize in 2019. You are both very welcome.

You have heard the discussion that we have had. Starting with Sir Paul, could you reflect on the dilemma that the Government palpably face that they have less money than they thought they had, yet made a



commitment in previous Budgets, previous documents and the Gracious Speech to investing £22 billion by 2024-25. What is your advice to Ministers?

**Sir Paul Nurse:** First, thank you for inviting me and Peter here to speak to you. I use a metaphor here of a field. We have a seedcorn to sow to produce us a harvest, and we have to invest to get that. There is no doubt that the Government are in a difficult position with finances, but if it does not invest now, it will not be able to reap the benefits of that field. It takes time to produce that. We have to have a country that thrives on its brains and its skills, and that comes and is driven by science and research in the most general sense, as Nancy said. I tend to use the word “scientia”, which is the Latin—especially when talking to the Prime Minister, of course— for knowledge and covers all research. We need to invest now if we are going to get out of the mess. The sums of money seem large but, compared with everything else, are not so large. Just to repeat what Nancy and John said, if this promise for the future is an empty pot—if it makes a sound but it has nothing in it—and is beyond the duration of this Parliament, it will not have any effect.

Q30 **Chair:** Thank you, Sir Paul. As an aside, within our report published last week, we note that the annual budget for the Test and Trace operation is twice the total UK science budget.

Sir Peter, perhaps relate this to the Crick. I asked Dame Nancy, as you saw, to consider the University of Manchester and the implications for it. Tell us how the prospective funding in the UK relates to your work in running a very successful institution?

**Professor Sir Peter Ratcliffe:** Yes, thank you. Just to echo what Paul and others have said, this is neither the time—that is obvious—nor the place for uncertainty or vacillation. We are post Brexit. We have had some operational problems in the management of Covid-19. The charitable sector is at the present time in trouble. So it is clearly not the time to vacillate.

Your question relates to the Crick. The Crick will thrive if it can bring the brightest and the best from across the world to the Crick—to the United Kingdom. It is as simple as that. This is a competitive situation. We are always on the edge—people might choose another place, and the very best people have the very best choice—so anything that is done to impair our credibility when we try to persuade people that the United Kingdom is the place to come or the place to stay will impair what we can do. Nancy has made the very good point that this is a long-term issue, and the better the staff we have, the more attractive we are. A cycle of negative reinforcement, of course, would be difficult to reverse, if we ever were to get into one for whatever reason, for example if we were to let people down, and the Crick and the UK were not the places to come to.

Q31 **Chair:** Thank you. There are clearly a number of different magnets for coming to research at the Crick—the opportunity to work with two Nobel prize winners is not available in every institution in the world, and I dare



say that might influence some people. In practice, when you are talking either to researchers based in this country who are looking around the world for their next position, or to people in other countries who you think could make a useful contribution to the Crick, are they aware of UK science funding and its trajectory?

**Professor Sir Peter Ratcliffe:** Yes.

**Chair:** They are.

**Professor Sir Peter Ratcliffe:** They absolutely are. About twice a week, I have a conversation with someone from outside the United Kingdom, usually from a scientific setting, and they always ask, "How are you getting on after Brexit? What are you doing? Are you really as brave as you say you are?" This crops up all the time and is at the forefront for people making career decisions, for sure.

You ask what would attract people to the Crick. There are two components. Yes, it is funding, but it is also existing scientists. Frankly, it does not matter whether they have a Nobel prize; it is the coherence of the body and its reputation. People talk about blue-skies research or whatever. I do not think it is a very good term. I use the term "passion-based research". Most scientists who are good at discovery and research are passionate about their research, and the draw for them is the quality of the Crick's existing staff, whether they have won prizes or not. That is a nebulous thing, but it is that that we are defending, and it is Paul's and my job to keep that positive reinforcement. If it ever became negative reinforcing, we would be in trouble. The money also counts—salaries also count, and if we can keep those high, that is a good thing—but people are enthused about coming to a centre of excellence. That is what we are trying to be at the Crick and, I guess, what people here, including the Government, want around the UK. We should be a centre of excellence.

Q32 **Chair:** Thank you. Before I go to Rebecca Long Bailey, let me pursue that a little further. You give a vivid description about people pursuing their passion in science. I do not want to put words in your mouth, still less thoughts in your mind, but is a consequence of uncertainty about future prospects and the future prominence of science in the UK the fact that people might worry whether they can, as it were, safely repose their passions here and so might want somewhere else to host them?

**Professor Sir Peter Ratcliffe:** Yes, that is absolutely correct. There is an issue of risk. There are two things here: first, they might not come; and, secondly, they might not do the work, because they think there might not be the long-term support to complete it.

The analogy would be discovery in other settings or adventure in other settings. There are large uncertainties in what we do, large prizes if we are successful, and absolute failure is obviously possible. If you were trying to row the Atlantic, investment in a state-of-the-art boat would be a good idea in reducing the risk of failure and the penalty of failure. If you were a pioneer farmer working in one particular valley in pioneering country, if you were poor, you would be less likely to explore the



adjacent valley, where in Sir Paul's analogy there might be very good ability to grow your crops.

We are particularly vulnerable to uncertainty. Discovery always is on the edge. It just might not be done. You just might not take the risk, or you might not take the risk to do it in the UK.

**Sir Paul Nurse:** Can I support what Peter just said there? First, passion really matters, as does curiosity—a passionate curiosity. Scientists are a bit of an odd lot like that. They are really driven by a passionate curiosity. We live, in our research, in an uncertain world. If you are prepared to take risks, you have to be really comfortable with that. But that does not mean they want to live in an uncertain world themselves, and they do look for security in terms of pay and so on, although pay never drives it.

I want to say that to date nearly every research group leader we have offered a position to in the past three years from overseas—approaching 30 of them—has accepted a position at the Crick, so we have not yet been influenced by issues to do with Brexit in that recruitment, but they always ask a question about it and are always worried about it. We have managed to recruit. I know that my colleagues across the country are not quite so sanguine about that, but we have managed to do that. What is the reason for it? It is again what Peter said: quality attracts quality.

We often talk about critical mass. I think an important variation of that is critical concentration. We have many great universities, for example Oxford, where I should say Peter's Nobel prize work was carried out, not at the Crick or its precursors. Oxford is a great institution. We at the Crick are much smaller, but we have a great concentration of quality, and that means that when you meet in the tea room, in the coffee room, in the lab or in the lift, there is somebody of quality to talk to, and that matters.

Q33 **Rebecca Long Bailey:** Thank you both for coming to speak to us today. On the issue of the Government's proposed investment target of 2.4% of GDP, do you think this is enough, particularly when we look at leading industrial nations that are putting at least 3% on the table? I know that Sir Peter talked about the competitive element of research. Does it really send out the right message if we are offering lower levels of investment than our industrial competitors across the world?

**Professor Sir Peter Ratcliffe:** We should clearly offer the best. You are right: we would be much more convincing if we went beyond that figure. I think we are talking about whether we can hang on to the 2.4% in the first place, and then it becomes even more important. This would be like the New Zealand Government not investing in rugby. We are quite good at it, and why wouldn't you invest behind strength? You might get away for a while with a slightly smaller investment than other countries, but it is unlikely to last.

**Sir Paul Nurse:** We have been underfunded in science for decades—actually, all of my life—and we bump around at the bottom of the OECD figures at around 1.6% or 1.7%. We always talk about how great we are



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at science, and often we hear—we heard it even today—we just need to develop it more. The truth is that if we had money, we would be absolutely spectacular at science. Let me just say that again: spectacular at science. We do very, very well on a very limited budget, and the Government have recognised that.

The Government's policy, which I expect them to deliver, quite frankly, is for 2.4% and they need to get there because, as I said before, by investing in science, they invest in every part of our country—our economy; the quality of our lives; protecting the environment. Everything is dependent upon science. I think the Government will deliver the 2.4%, established in a policy statement of theirs, because they recognise its importance.

Could we do better than that? As Peter said, yes, of course we would, because by the time we get to 2.4%, the OECD average is going to be 0.2 or 0.3 above that—and that is just the average. We should be aiming beyond that, but let us today ensure that we get 2.4% and encourage the Government to follow this big idea—and this is their big idea. Let us encourage them to deliver it.

**Q34 Rebecca Long Bailey:** On the 2.4%, you will have heard me mention in the previous session that there has been a lot of criticism of the Government's road map towards this figure and the lack of detail, and the fact that the plan is a set of proposals rather than a detailed one. What is your view on the road map and what do you think the Government need to change?

**Professor Sir Peter Ratcliffe:** The greater the clarity, the better. I can see that it is difficult to impose that at a Government level with the precision that we would like.

I guess I am here in part to promote discovery science. I was very pleased to hear the comment that whatever else you fund, do not take away the base. It cannot possibly be sensible to try to solve a translational problem at the expense of discovery science. If that were imprinted in the road map, it would be really important for us.

**Professor Sir Peter Ratcliffe:** I have a quote here from George Porter, another Nobel laureate, just to emphasise the point that Peter just made. He was a great one with words. He said: "To feed applied science by starving basic science is like economising on the foundations of a building so that it may be built higher. It is only a matter of time before the whole edifice crumbles". We need investment across the board. We absolutely need investment and application to encourage industry to support research and development. We also need support for discovery research. It has to be across the board.

As for road maps—do you still use one to navigate in cars? I am not sure that we do. We should not get distracted by too much detail. We should first of all get the budget sorted. If it is all fragmented into little bits, we will end up with endless arguments.



We are life scientists. I have never been awfully impressed with the life sciences strategy that we have had, I have to be honest, because it was not ambitious enough and it was too narrow. It focused just on the pharmaceutical industry; it did not focus on agriculture and the industrial use of living organisms, all of which are closely interrelated and integrated. So I think we need a strategy that is expansive, ambitious and exciting, not just one written by McKinsey or something, but something that is connected to research and finding out how we can use research to drive our economy.

Often we say, "Well, if we had this money, we could develop this discovery into this." That is where the discussion goes. That is important, but it is even more important to discover the things we do not yet know need discovering. It is a sort of variant of the Rumsfeld quote, I agree, but we need to invest in discovering the stuff that we do not yet know about as well as in the stuff that we know about, and get industry to invest in that. Any road map needs to take account of all that and it needs to be ambitious, exciting and something that sets us alight.

**Q35 Rebecca Long Bailey:** That is brilliant, thank you. Finally, on the question of regional imbalances, you may have heard Dame Nancy mention that in the north-west in particular, although we have received less public funding for research and development than the south-east, it has been topped up by private investment, so imagine what we could achieve if we had increased levels of public funding. In 2019, there were some staggering figures that suggested that the south-east was receiving up to 61% of public R&D funding. Do you think this is something that the Government need to address in the spending review if they are serious about levelling up, let's be honest?

**Professor Sir Peter Ratcliffe:** I should take that one because I am clearly from the north of England. Nancy answered it fairly: "Please do not take away from what is doing well, whatever you do." It was very honest of her to say that, and, as a northerner, I also believe that is true. Of course, the north of England was not a disadvantage to me. I have moved down, but I do go back. I still count myself as a north of England person, so that is all fine.

I guess the question is: since we are cash limited, what would be the best investment to match what could be done? I had a very good schooling and there were some extremely good secondary schools in the north of England, including Manchester Grammar, which was not mine. I think investment there would be important in supporting the north of England. But just do not take it away or level it out for the sake of levelling out please.

**Sir Paul Nurse:** I spent quite a few years working in Scotland, and I went to university in Birmingham. I do not know whether Birmingham counts as the north. I do not think it does. Poor old Birmingham never gets a decent look-in. It is neither south nor north. It is quite unfair.

**Chair:** It gets a good hearing in this Committee, Sir Paul, I have to point



out.

**Sir Paul Nurse:** Yes, we know that.

**Carol Monaghan:** It is south in Scotland.

**Sir Paul Nurse:** I think this is quite a tricky thing. As we have already argued, quality attracts quality, of which we have concentrations in certain areas. If I speak to somebody from New York or from Paris or somewhere, it is easier when I am in London. You have to just accept that that is the case.

In the sort of research we do, we are fundamentally cheap. That is why it is so ridiculous for us to be arguing so much about the money. However, we could try to be clever about this. We should—and we fail at this—have permeability and fluidity across the nation. I think we need to think carefully not just about plonking something in Rotherham or somewhere that will provide perhaps 100 jobs in research, but also about how we get discovery and research out across the nation, particularly where it creates economic wealth, which happens essentially through commercialisation. You may need to start up somewhere else, but you can commercialise elsewhere, and that is how I would focus on this.

We cannot have just a mantra about it; we must have a more sophisticated view. This is clearly a problem and we know what it is. Britain's wealth was built on 19th-century industrialisation and we hollowed out the north and did not replace anything, and it is time we did something about that. As a country as a whole, we need to produce ideas and knowledge, and get them across everywhere with permeability and fluidity.

Q36 **Rebecca Long Bailey:** As a follow-up question, do you think that the Government's manufacturing strategy is supportive enough to allow that scale-up in commercialisation that you hope for, Sir Paul?

**Sir Paul Nurse:** I am not the brilliant one on this sort of thing.

**Professor Sir Peter Ratcliffe:** Presumably not, from what we have heard. I broadly think I would agree. I am not a commercial person. Some of this idea that the UK cannot translate might just be historic. I would agree with Nancy's statement that the problem appears to be more with the scale-up to big companies rather than selling up small companies. So I think there probably is something that is wrong there.

**Sir Paul Nurse:** Maybe I would add something about that, because I ran a research university in the US—in New York—for seven or eight years, I noticed a different culture in the US. I have tried to think about it and I do not know whether I have it right. One thing that mattered was the much bigger market—I do not think we should under-emphasise that—in the US. The second thing was the amount of money that would be invested.

We have sold off our tech, as Nancy mentioned, at a sort of medium level, when initial investors could make a significant sum. Time and time again we have seen these grow fivefold or tenfold when they have been



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bought up into the US, as they usually have. There is something not right about that, and I think that is where we need to pay attention. We need to have brave investors who will not consider just the short term.

Another thing, too: we are too short term. Invest for the future—long term. That is the answer to the Government's problem financially now. They have to invest for the long term, and so do industry and commerce.

**Chair:** Thank you, Rebecca. Just before I bring in Graham Stringer, I think Aaron wanted to come in on a particular point.

Q37 **Aaron Bell:** Thank you, Chair. Just on the levelling up point, you have answered a lot of what I was going to ask in your further explanation, Sir Paul, but the critical concentration point you made—quality attracts quality—is very hard to square with what we want to do with levelling up. Do you think it is possible to create more Oxfords, Cambridges and Londons elsewhere in the country, and how much would we need to invest to do so, or is there just going to be the sort of diffusion effect that you talked about? Is it possible to get that critical concentration in cities in the north?

**Sir Paul Nurse:** Aaron, I am not sure I have an answer—I will be perfectly frank with you—but I think it is a very, very important problem that we need to wrestle with. The first thing is that we should encourage diffusion as much as we can. Let us not sneer at that; we have to do it. And I think it would be interesting to have some sort of hub-and-spoke connections. That could be a model to follow.

We are a massive attractor in the Crick, but remember what we do—well, perhaps we have not said it. We do not hang on to people in the Crick. They have a limited tenure there. We try to work with them to place them somewhere else in UK, and they go to other places outside the golden triangle. That is a very long-term strategy that we are not following yet, and unfortunately it is not a strategy that universities will follow. For example, Oxford will often hang on to its best people, and we may need to have greater diffusion. Peter may disagree with that.

**Professor Sir Peter Ratcliffe:** Yes, I had for 12 years the dual experience of running a big department in Oxford—I contributed to its REF return, which was quite good in the end, thankfully for me and the university—and the Crick. The Crick's model is different and you need to be aware that there are some effects of REF that are extremely perverse. As a young doctor at the Hammersmith hospital in the 1980s, the professor prided himself on placing his people in every medical school around the country. That was the sign of success. In Oxford I kept everyone, and all the universities do that, which is a perverse consequence of the REF and is very counterproductive to the north-south divide or any other divide.

The Crick's model is indeed different. We are funded differently and we have an overtly different strategy. I think it is fair to say it has yet to work through towards the north of England, but it has the potential to. It is a very important counterbalancing model.



**Chair:** Just before I turn to Graham, I should acknowledge that I spy in the public gallery the Science Minister, George Freeman, who has come in person to observe our proceedings. Welcome; we are very grateful for your attendance at our proceedings.

Q38 **Graham Stringer:** Sir Paul, we are still in a crisis, and science is at the centre of dealing with Covid. At the start of the pandemic, you made a very welcome intervention in the debate. This Government did not get everything right, and no Government would. What do you think the experience of that tells us about the structure of science in this country and how it could be improved?

**Sir Paul Nurse:** The first thing to say—we at the Crick made only a small contribution to this; contributions were made across the entire country—is that this has demonstrated beyond doubt that science matters and it matters to us all. That is a really important step to be made. We have thought it for a long time, the public now think it and so do the Government. That is a point of inspiration and of winning hearts and minds—that is part of it.

What I learnt from it—it was indeed learning, and it made me think much more about the words “permeability”, “fluidity” and “exchange” that I keep using—is how interesting it is when discovery scientists, pointy-headed people like Peter and me, are connected to real life. When we were in the wards—I should say Peter does that because until recently he was in A&E for a session every week, but that did not apply to me—it was a very interesting situation because we brought technology, brains and different ways of thinking about things to real-life problems, we learnt what those problems were, and we could contribute to them and they could contribute to us. That is why I am increasingly talking about permeability and fluidity.

Let me say this in order to suppress the snobbishness that can arise—I will say just this and move on—between these different sectors. We achieved something that was special. The vaccine was a combination of academic research, innovation—do not forget that there was innovation going on at Oxford in Peter’s department, incidentally, just to be clear about that, which he played a big role in creating—and, of course, industrial connections that could uplift this to a point where it really mattered.

This permeability of people and ideas, from the pointy-headed people to people doing stuff, was something that I learnt from it.

Q39 **Graham Stringer:** That makes a lot of sense, but if you were writing a report from this Committee, how would you turn that into a recommendation?

**Sir Paul Nurse:** Oh dear, I thought that was your job.

**Graham Stringer:** We need the aid of a couple of Nobel prize winners.

**Sir Paul Nurse:** I would focus on these words “permeability” and “fluidity”. I do not see enough interchange between academia, industry, commerce and public services. I sometimes wonder whether the



universities could play a role here. They could have something on their campus where you drop in to talk about stuff. Let us take public services for one. They could do with thinking in a research-focused way. Mixing people up from these different places, I think, could be very interesting.

You have to write your report. I am doing a landscape review of research, which we might get on to, and I am thinking about things like that, but I do not yet have the solutions—I will be frank with you.

**Q40 Graham Stringer:** As we come out of the pandemic, it is going to be a very difficult financial period for the country because we have spent so much on finance. I think science in general has missed a trick here, because people have been concentrating on the science and people who have never thought about science have been thinking about it. Scientists are not very good at blowing their own trumpet and shouting. As you said before, they like being in the laboratory and discovering things. How do you think that can be improved?

Let me just give an example that shocked me. I read Sarah Gilbert's book. I am summarising in a couple of sentences, but she basically says in it, "We could have had these vaccines"—not for Covid, because it was not known—"much earlier if it was not for the erratic process of the funding." I do not think science is shouting loudly enough about what could have been achieved beforehand. I guess you agree with that, but what would you add to it?

**Sir Paul Nurse:** Do you want to go for that and I will follow up?

**Professor Sir Peter Ratcliffe:** The first point is that it was not bad. The UK has had a difficult time operationally with Covid and I do not think it has excelled. Scientifically, it will probably be No. 1: if you count the trials and the vaccine, we have made more contributions than any other nation to the management of Covid.

Yes, it was my department where the vaccine started. John Bell put the Jenner Institute in the department of medicine, which I ran. There was a very interesting decision there. University money was spent on a vaccine manufacturing plant, and that plant enabled the vaccine to be made at small scale and trialled, and known to generate antibodies, at a very early stage. If the department had been broke, like many are, we would not have been able to do that. It was an odd decision to make in a university academic setting, but because we had just a little bit of spare cash, we made a little bit of an investment. Sarah argues it should have been bigger, but of course that it is in hindsight. But we did it, and it illustrates what happens if you are not knocked down absolutely to the last penny. That is important.

I agree with Paul and what has been the sentiment around the table that there does need to be a mingling of the culture between science and industry, and we are working on that in various ways at the Crick and we were working on it in Oxford. I think there is progress, and it is important not to be impatient about it. I think it will work, but the fundamental thing is that it cannot if you cut the discovery engine, for all the reasons



we gave.

**Sir Paul Nurse:** Graham, could I slightly expand your question? It is really about a proper relationship between science and society. This is a phrase that was used 20 years ago by a Minister for Science—I have forgotten who it was now—which was that we need to create a society that is comfortable with science and that embraces it. I think we have an opportunity for that as a consequence of Covid.

We often talk about how good we are in science in the UK, which is true. I think this has a cultural origin from the fact that we are a free society and we encourage free debate, and science is built on exactly that. We go to our labs and we are the same as our graduate students. Everybody argues with us in the same sort of way. It is a very democratic thing, and if you live in a democratic society that respects empiricism, facts and evidence, science thrives, and I think that is one of the reasons why science has thrived in the United Kingdom over many years.

Then we come to schools and education putting science at the centre, understanding that science can be tentative knowledge and that it gets it wrong. It is not chiselled in granite, as I sometimes say, but the constant testing and constant challenge make it more and more secure.

We have a message for society there that would make people more comfortable with science and, therefore, would lead to more support of science. We scientists have to do something about it, but you politicians have to do something about it, too, to drive that through all parts of society.

Q41 **Graham Stringer:** My final question goes back to Becky's question about levelling up. Sir Paul, previously when you have been to this Committee and we have talked about the location of the Crick in London and how it can relate to the regions, I think you have talked about satellite groups from the Crick elsewhere in the country. Do I take it that, from what you and Sir Peter are saying, you now believe you are sending out missionaries from the Crick, rather than creating satellites? Has there been a change of policy?

**Sir Paul Nurse:** I always worry about missionaries because we get into colonialism, and then we are in real trouble, of course. I think we can attract good people and we can try to place them. They are not just missionaries; we could establish outposts and have a sort of mothership. I think that could work—by the way, not everything should be like the Crick, don't get me wrong, but I think we should have some diversity where we are more outward looking than a REF-driven university. Having a Crick-like place located near a northern strength might be an attractive way to then put satellites out nearby—Manchester would be one possibility. I think we have to take this on by being outward looking, and by letting our best people go at the right time and seeding them throughout the country. It is a completely different way of doing it and I think it could pay off in the levelling-up agenda.



Q42 **Carol Monaghan:** Earlier I asked some questions about international collaborations, and I want to ask first about the ODA cuts and whether they have impacted the work you are doing at the Crick at all. Sir Peter, maybe you want to start.

**Professor Sir Peter Ratcliffe:** It not only impacts us; quite plainly, international interactions are our bread and butter. Science is an international thing. You could be a national champion or a world champion. It helps to be the national champion; it is not helpful to be the national lead in a particular area of research—you have to be international, you have to lead and your work has to have international impact. I cannot answer your question so specifically as to give precise examples, but the general run is that any reduction in international interaction and international support is bound to entrain a penalty from our perspective.

**Sir Paul Nurse:** You have heard from all four of us that international contacts are critical. We had very significant funding from European Community sources, which we want to maintain with Horizon Europe. It has to be said that there is enthusiasm for Horizon Europe both within the UK at Government level, and also within the European Commission. Unfortunately, there are higher level political things, a lot to do with the Northern Irish situation, that are causing a problem in coming to an outcome, but we must hang in there. Although one can talk about alternative plans and recreating something separate, it would be a backwards step.

Of course, we have moved from a situation where we were subsidised by the European Commission to a point where it is the reverse. That is just an outcome of the decision we made to leave the European Commission. But is very important for us to attract people, and that European funding has a higher prestige in the people we attract than any national funding. It is remarkable that the best people we attract are very keen about European Research Council funding. So this is quite important symbolically.

Q43 **Carol Monaghan:** Can I just interrupt you and ask this? If that is symbolically so important, is it affecting your ability to attract people from European countries or elsewhere?

**Sir Paul Nurse:** It has not to date, as I said, but I have the discussion most times when somebody comes to us, about both the symbolism of it, which you have heard about already, and the reality of it, because of the kudos. It has not affected us, because we have reassured people that Horizon Europe will work. If Horizon Europe does not work, and I think it will if we have patience—

Q44 **Carol Monaghan:** Are the delays to that ratification causing issues in terms of what you are doing on the ground, rather than just reputational problems?

**Sir Paul Nurse:** Not yet for us in the Crick. There is uncertainty, but we are reassuring people that it will be delivered. If it is not, that will



become an issue. I believe it is an issue elsewhere, but that is anecdotal.

**Professor Sir Peter Ratcliffe:** We have just assumed that it couldn't not happen. It would be so awful. I have personally written an application on the basis that we will be on Horizon Europe. As Paul said, it would be a massive reputational problem. There are as many soft parts to it as there are hard finance parts to it, so if we were taken out of that, somehow we would be less credible in all sorts of ways.

Q45 **Carol Monaghan:** Sir Peter, what about this? The Wellcome Trust has said it reckons that the amount stated for association with Horizon Europe was artificially low. Are you concerned that if that increases in subsequent years, it will affect other areas of R&D funding?

**Professor Sir Peter Ratcliffe:** Hopefully it would not be at the expense of other sources but, nevertheless, I think I would stand by the arguments that there are additional positive aspects to this beyond the finance. It is in fact worth significantly more than the financial deal. Obviously, the financial deal has to be reasonable, and I cannot comment on whether it might ever become unreasonable. So the Wellcome Trust is correct that there would be a tipping point, but it would not be on a straight financial balance, because the importance of this is beyond that.

Q46 **Carol Monaghan:** Let me ask a final question. We are hearing about the importance of your international partners and collaborations. What else should the UK Government be doing to enhance and protect these collaborations?

**Professor Sir Peter Ratcliffe:** It is obviously very important that people can move freely to and from science, and although a certain amount has been done to ensure that, it is not all in place. For instance, we were told yesterday about MSc students—masters students—coming to the Crick, and there are impediments to that which could be removed by the Home Office, for instance, defining the Crick as a higher education institution for that purpose. There are quite simple things that could be done. So we are experiencing some impediments, and people might argue that that is not unnatural in a transition phase, but they will need to be cleared up.

**Sir Paul Nurse:** I think something needs to be done with the rhetoric. Brexit has been like a divorce. It could have been a divorce in amiable terms or not. It is not particularly amiable, and we are suffering the consequences of that. As in divorces, as time goes on it will probably get better. I think we need first to hang in there, and secondly to sort out our rhetoric and try to be nicer to our colleagues in continental Europe.

Q47 **Dawn Butler:** Just picking up on what you were saying, Sir Paul, about the kudos that comes with European funding, it seems to me that the Crick is somewhat insulated, because of its reputation, so it will not suffer as much as other scientific institutions. Is that a correct summary?

**Sir Paul Nurse:** It is a little early for us to say, because we have been operational only since 2017, to be quite honest, so we are the new kid on the block for sure. However, we have certain things to our advantage



which have helped us. One is that we are in London. We have to attract 20 to 35-year-olds, and they like coming to London. It is exciting for them. We just have to accept that they do. That helps us. A second is that we get funding but it is not for projects. Unlike at a university, where every individual has to write for projects, we as leadership have to write a case and then we are given the money, which is discretionary for five years. Then our funders—the biggest is CRUK, MRC is very similar, and we get a smaller amount from Wellcome—come and evaluate it. We are in the middle of it. We are about to have our five-year review—in three weeks' time, in fact—so that is mostly what we are doing.

The discretionary funding—in the universities it is called QR, of course, which is part of it—has given us a lot of flexibility to be able to cope with these sorts of issues, because we divert money to where it really matters. I am thinking that other research institutions in this country need the discretionary money, given that most of the PSREs—public sector research establishments—have none. The universities have a lot with the QR and still want more, but our research institutions hardly have any. The Crick is almost unique in being given a sum of money that it can use in discretionary ways, and that is giving us protection, I think—I know I have diverted—and a lot of strength to be able to deal with international recruitment.

**Professor Sir Peter Ratcliffe:** We are less vulnerable, but we are still vulnerable. Not unreasonably, people expect more from us.

**Sir Paul Nurse:** Yes.

**Professor Sir Peter Ratcliffe:** So we are still vulnerable against that. There would be not a cat in hell's chance of bringing someone out of Memorial Sloan Kettering to some parts of the country. We would have a chance to do that, but we are still on the margins as to whether we succeed.

Q48 **Dawn Butler:** Just very quickly, I quite like the idea of your pop-up science shop idea, where people come in and just talk about science ideas. Do you think that would be something that the Government would fund through R&D, or do you think it would be privately funded?

**Sir Paul Nurse:** When you say pop-up science—

**Dawn Butler:** You spoke earlier about having a place where people can come in and give their ideas.

**Sir Paul Nurse:** Oh yes, sorry. Yes, I am playing with that idea. I think there should be a Government or university-funded pop-up that connects with the community. I think that is something to think about that could become public.

**Chair:** Finally, Aaron Bell.

Q49 **Aaron Bell:** Thank you, Chair; yes, I will be brief. You have spoken a lot about attracting international talent, but there is obviously a major job to do on the domestic workforce.



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**Sir Paul Nurse:** Yes.

**Aaron Bell:** The implications of the funding increase that we are going to have is, as I think the previous Science Minister said, to get more than a quarter of a million new people into R&D roles. Do you think that the Government are doing enough to ensure that we will have enough bodies in the system to absorb the planned increases in R&D investment?

**Sir Paul Nurse:** I think they recognise the problem. I should clarify something we are saying. We are talking about group leaders we are recruiting internationally, because this is at a very high level, but they need to be supported by researchers, and I think that is largely what you are thinking about.

**Aaron Bell:** Yes, that is what I am asking you about.

**Sir Paul Nurse:** Those are to some extent recruited from abroad but also, of course, to a significant extent within the UK. We have tried to set ourselves up in the Crick to attract people, train them and send them out again, which we do from technician level upwards. We see it as a place where we train people who then inhabit the rest of the country. We are small, but that is a model that I think should be looked at more fully.

It comes down to education—investing in education and the correct skills—and there is only a little bit that places like the Crick can do there, because it is a Department for Education responsibility. I sometimes think we have rushed too much to send everybody to universities rather than alternative

means of skill acquisition, and if we look at other countries, such as Germany, that is not the case. I think that needs some attention too.

**Aaron Bell:** So you would welcome things like degree apprenticeships.

**Sir Paul Nurse:** Exactly.

**Aaron Bell:** Sir Peter, did you want to come in?

**Professor Sir Peter Ratcliffe:** I am not sure that I understand all the implications of the question, but to my mind it is rather similar to the long-term issue that Nancy Rothwell was talking about. The concern is: if you “turn the tap on” in one part, would that be properly supported by other parts? The answer is: no, it would not. Her point was that this is a very long-term thing. When you have established an infrastructure with all the interactions, if you dismantle it you cannot recreate it like you could, for instance, attract a major motor manufacturer in with corporate tax breaks or some incentive—it is not too difficult to transport those skills and get the whole infrastructure working. For instance, if we do not have jobs for people in cell biology and biochemistry, people will not train and it will not be an attractive undergraduate career, so you have lost a whole decade or generation of people. Then when you do not have the students applying to the course, the university will not run it, so you do not have the teaching capacity. So it is extremely interactive. I think that was your point.



Q50 **Aaron Bell:** The implication of the increase in funding is that there will be more jobs to support, and the question is: first, how do we make sure that we get the pipeline of people being persuaded that that is a good thing to do and that we take advantage of what Graham mentioned earlier about this “moment for science” with Covid to inspire them; and, secondly, how do we make sure they get the right skills to be your technicians and your junior researchers?

**Sir Paul Nurse:** If we accept that science is the way forward for our nation—that is the big idea—it should be across the board, starting with education, so that we have a society comfortable with science, getting the skills put in there, and investing the money in the whole spectrum of research at a decent level. Then we will deliver it. I think the Government have glimpsed that and accepted it, but they need to deal with some detail, probably, to deliver it.

**Aaron Bell:** Thank you.

Q51 **Chair:** Thank you very much indeed, Aaron. Finally, Sir Paul, you made reference to the review that the Government have asked you to undertake—it is a repeated habit of Ministers to ask you to conduct important reviews. Just for the benefit of the Committee and those watching, perhaps give us a potted summary of its purpose and remit.

**Sir Paul Nurse:** I can do that. I brought the terms of reference with me, just in case you were to ask me that question. BEIS and Kwasi Kwarteng, its Secretary of State, have set it up, and George, who I think is still—

**Chair:** He has just left.

**Sir Paul Nurse:** He is now linked with it as Science Minister. The goals of the review are to explore the present ecosystem of research, development and innovation-performing organisations across the UK; to see what we can learn from the rest of the world; and to identify whether there need to be any improvements or diversification there. I think it is part of the Government’s policy of supporting science and wanting to see it drive the future of country, and it is having a look to see whether there are some changes that we need.

I have put together a scoping group, which is not yet complete. It includes, for example, David Willetts, whom we have already mentioned, Demis Hassabis, from DeepMind, and various others, including a past chair of the Russell Group, Anton Muscatelli. We have been focusing on some principles for what is required to generate high-quality research that we can then apply in different parts of the sector. I will not yet go through those things, but you can imagine the sorts of things they are. We focus on the importance of leadership, by the way, and of driving things forward, and on keeping bureaucracy to a minimum, because we are hearing repeatedly that there is too much in the system, which is something we want to deal with. I am particularly interested in ensuring that there is permeability across the system in the ways that we have mentioned. We are going through those principles and have made some progress there. We are looking internationally at places we can compare



with. By April we will have come up with some recommendations as to what should be done with present organisations, perhaps, to improve them and whether there needs to be some change in balance or maybe new ways of doing it. I think that is where we are.

**Q52 Chair:** That is extremely helpful. You are always very generous with your time in keeping the Committee abreast of developments, and I am sure we will want to go into more detail on that. Just pertaining to our session today, which, as you know, is looking forward to the Budget next week and some of the concerns about the science budget, one possibility that might present itself to someone with some experience of government, if put in a tricky spot, might be to say, “We have Sir Paul looking at this landscape in very far-reaching and fundamental terms. It would be premature to make any settlement of the Budget until we have heard Sir Paul and his colleagues’ words of wisdom. This is going to be in April, so we will defer all this.” Do you think that is a risk, and are you concerned that, in doing some very good work, the Government might deploy you as an excuse?

**Sir Paul Nurse:** I am not politically very skilled, so I would not quite know how to deal with that. I would say that the Committee could perhaps let the Government know that the UK is very good at science but could be spectacular, and that the review that we are doing will hopefully put some signposts towards making it even better, but that absolutely nothing will work, as Peter has emphasised, unless we have increased resource. We have to maintain what we have and we need investment. It is back to the seedcorn. We have to put the seedcorn in there and pay for it, and then we will reap a harvest. Whatever else, we require the money to make this system work.

**Q53 Chair:** To be very specific, there is nothing in your review and in what you are conducting that should stay the hand of the Government to making—to keeping—a budgetary commitment to science in this case.

**Sir Paul Nurse:** No, they go hand in hand. The review, of course, assumes that there will be the money to allow our scientific endeavours to flourish.

**Chair:** You have both been admirably clear. We are very grateful. I think I speak for us all in saying that we are a little anxious when we take you away from your laboratories and the important work you do in order to help us. We are very grateful for the time that you have spent and, indeed, for the very important work that you do in those laboratories. Thank you very much indeed, Sir Paul and Sir Peter.

## Examination of witnesses

Witnesses: Sir Adrian Smith, Sir Andrew Mackenzie and Lord Browne of Madingley.

**Q54 Chair:** We now go to our final panel of witnesses. In person, we have Sir



Adrian Smith, who is the president of the Royal Society. Virtually, we have—I see him on our screen—Lord Browne of Madingley. Lord Browne is the co-chair of the Prime Minister’s Council for Science and Technology and, among many other important positions in industry, was group chief executive of BP from 1995 to 2007. We have Sir Andrew Mackenzie, who is the current chair of UK Research and Innovation, a post that he has held from the summer of this year. He has a very substantial background in industry. He was the chief executive of the global company BHP from 2013 to 2019, and he is currently chair of the board of Royal Dutch Shell, but I should say that he appears here in his capacity as chair of UKRI.

Perhaps I could start with Lord Browne. You have perhaps heard some of the evidence that we have taken so far about this important moment for science strategically for the country and the difficulty that the Government palpably face in their budgetary situation post covid. They are grappling, we expect now, with the difficulty of meeting a very clear commitment to double the science budget, which entails investing £22 billion by 2024-25. With the dilemma that they face with the budgetary situation, what would your advice be on meeting that commitment and getting to the 2.4%, particularly reflecting on your industrial career?

**Lord Browne:** Good morning. The single most important thing to remember is that the Government are a very important part of the investment in science and technology, but the most important part is business and industry. As of the immediate past year for which we have reports—2019—the ratio is £1 from Government producing £2 from industry. That is a change, because it has been slow to get to that level. It has to be sustained at least at that ratio. A really great country would have a ratio that is even stronger. You would expect to get more money from business than 1:2—probably 1:3.

The first point is that it is very important to have stable Government spending and for businesses to see a plan for the future. If they do not see a plan for the future, most businesses will say, “Let us hold back until we do see a plan.” Remember that everything that the Government do has to be magnified by business, which therefore means that business needs the confidence. It obviously also needs—I am sure you have a lot of evidence of this here—the quality and depth of science and technology expertise and the basic research and development to be in place and for all that to be working well. That gives business further confidence that it is worth doing business in this country and building on the great achievements of the past in science and technology.

We have thought a lot about that at CST of course and about the UK as a science superpower and made these very points. Plenty of other details can be examined.

Q55 **Chair:** Thank you. Sir Adrian, reflecting on your perspective heading the nation’s science academy, how important is the continuity of meeting commitments made to the people and institutions that you deal with?



**Sir Adrian Smith:** Just going back slightly, one has of course welcomed the rhetoric and aspiration of “science superpower” and the recognition of the fundamental importance of science for the future of the UK.

Following up on John’s remarks, we have to be very clear that a signal will be sent at the end of the spending review. The nature, the tone and the content of that signal is fundamentally important. It is fundamentally important for the research and science community itself, of course. We have a fantastic science base and I am sure you have heard a million times the basic numbers that with 1% of the world’s population and less than 3% of global R&D we produce more than 15% as measured by highly cited research papers. So there is a signal to the research community itself and to the morale and the rationale there and the ability to attract young people both within the UK and those with aspirational careers from overseas, but there is also the signal, to which John has referred, to the private business investment community.

If we don’t have a clear signal that the funding is going to come in behind the rhetoric and the aspiration, we are not going to get that leverage of private investment. You can’t do it on an on-off basis. You can’t do hockey-stick-shaped funding where you don’t do much for a couple of years and then you bung in a lot. We need a clear, sustainable path to the £22 billion by 2024 and a clear signal. The danger of a negative signal is potentially disastrous.

Q56 **Chair:** Can you elaborate a little on why not the hockey stick? Suppose the Government were to say, “We have a current crunch but a very significant long-term ambition. You have got to bear with us for a year of two.” The trajectory is going to be like a hockey stick. It might be flat or even go down for a couple of years, and then sharply up.

**Sir Adrian Smith:** I think I overheard in the previous session a question about whether there will be the people to follow in behind the R&D investment. You can’t suddenly turn on a huge number of people. You need a continuous sustainable path.

Q57 **Chair:** Sir Andrew, you have a wonderful job that you were appointed to in the summer. You were appointed to chair UKRI, with the very ambitious settlement proposed to double the science budget. A few weeks into the job, you are straight into a fiscal wrangle on the settlement of your budget. Drawing on your first impressions in the role and, as you did when you appeared before the confirmatory Committee, a lot on your substantial distinguished career in business, what does that lead you to want from the settlement?

**Sir Andrew Mackenzie:** Clearly it is an important part of my job to make the case for more spending on research and development.. You are absolutely right. I have probably spent a large part of my time doing that since we last met as a Committee.



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What I would say first is that the organisation that I now have the honour to chair has definitely got a lot of cut-through in Government. People understand what we are trying to do. They get our message and, on the whole, they feel positive about us and positive about wanting to support us more. But, of course, the second message is that money is tight and, although they might like to do more, they may not be able to do as much as I would wish, and maybe as much as they would wish, to be honest.

I do feel we have been given a very fair hearing. We have been listened to and I personally have repeatedly had access to the highest levels of Government during this process, so I absolutely feel listened to. As John Browne said, we are on an improving trend in terms of industrial participation. I see a lot of things within UKRI where the ratio is substantially greater than 2:1, which already is quite competitive internationally. I see huge potential.

I await with interest the Government's final conclusions, but I stand ready to work with the whole of UKRI to deliver on that and position UKRI in the most positive way I can. I will of course want to do that both for industry and for the academic community. I have certainly been heard.

**Q58 Chair:** Thank you, Sir Andrew. Before I turn to Graham Stringer, will you tell us your assessment of the potential for a hockey-stick settlement that is either down or flat for the first few years and then sharply higher afterwards. You have heard from Sir Adrian and Lord Browne about that, but what is your view?

**Sir Andrew Mackenzie:** Of course, the sooner we get going on a sort of monotonic or flat gradient, the better. We can prepare for a hockey stick if that is necessary, but we would obviously prefer a flat gradient—a constant gradient, I should say—that we could invest into in all the ways that John and Adrian have described.

I have been at pains to stress that we have still work to do to improve the efficiency and effectiveness of UKRI and to improve the extent to which we can crowd in funding from industry and from overseas and get that partnership working. If there were any reticence around making things a steady gradient, it is my commitment in the coming years to deliver an even more effective performance of UKRI in both its narrower and broader definitions that would earn and secure the funds in later years. It would be nice, however, to have a bit of that earlier, but we will work with what we are given in the most positive way possible.

**Q59 Chair:** Do you think there is an understanding among your interlocutors in Government of the importance of a steady gradient for the reasons that Sir Adrian and Lord Browne gave?

**Sir Andrew Mackenzie:** Yes. I repeat what I said earlier. Absolutely—both in the way that we prepared the bid in base and in my conversations with the Treasury that continue and with No. 10. There is a good



understanding. We have been heard, but we understand that there are many other things that they have to trade off. We stand ready to deliver.

Q60 **Graham Stringer:** Unsurprisingly, all our witnesses this morning have made the case for science funding. When you talked to Government, I am sure you will have made a similar case, but are there any areas that you focus on that you think will be particularly attractive for the Government to fund and invest in?

**Sir Andrew Mackenzie:** I could answer that question in two parts. I think you are asking about particular areas of scientific endeavour and also about areas that may be helpful to Government policy. Perhaps I should start there. In our submissions we have been clear that we think we can make a material difference to the levelling-up agenda. The work of UKRI and the work of universities and where they are placed in the community can be more fully leveraged to support the levelling-up aims of the current Government.

I am reluctant to refer to any areas of specific science. One of the great strengths of the UK is that, despite the relatively small scale that Adrian referred to, we are strong across the spectrum. There are one or two areas where we would like to get stronger and we should play to our strengths. Playing to our strengths would be playing to the majority of the portfolio of science as people would discuss it internationally. Clearly, we need to do a lot more work in life sciences and clearly we believe that the technological endeavour in order to get to net zero needs to be bumped up.

We see this as a huge opportunity for the UK, which has shown leadership in many ways in moving towards net zero. It could be the focus of creating successful businesses for the UK and exports in the time to come, and a huge source of employment. We are very keen to see that as well. We are making a lot of progress in artificial intelligence and we would like to see more. I could go on, but I would rather not be pushed into having too many favourites, because we can offer success across a broad spectrum that will appeal to the broad spectrum of industries.

The main point of our view is that money spent in UKRI can be used for many purposes. Ottoline Leyser, our chief executive, is a Scrabble person and talks about a triple-word score. You invest in one thing in the UKRI but you get three or four times the benefits in other areas by being careful about how you target things and by bringing things together in the right way.

Q61 **Graham Stringer:** Interesting. Let me approach the question from the other side and your direct responsibility for funding the research councils. One of the reasons for UKRI was that ratios between the funding for the research councils had ossified and stayed the same year on year. Have you changed those ratios or are you intending to do so?



**Sir Andrew Mackenzie:** Yes and no. We have, as a consequence of discussions that Ottoline and I have had with the Secretary of State, embarked on an exercise to write a longer-term strategy for UKRI. In that, I expect that we will address some of the issues of how UKRI is wired, what the ratios are and whether we should be making more systemic changes as a consequence. That work is very much in progress and we expect to report to the Secretary of State—I expect you will want to talk about this as a Committee—some time towards the end of the year or next year.

The second thing—I heard this in the previous submissions—is that we are very interested in concerns about bureaucracy or the overhead, if you like, of UKRI, and there may be ways that we might want to change the way we do things to simplify that bureaucracy and to liberate more researchers to get on with research and leave some of the important job of public accountability and how we converse with you to parts of UKRI and have it a little bit less diffuse. I am probably giving you a longer answer than you were looking for.

We will look at the ratios and we will also look at the way in which we are working. We are actually going to have a formal review of the success or otherwise of the UKRI in its first three years, which will give us lessons learned, and I will be absolutely happy to come back and talk to you about that at a later date.

Q62 **Graham Stringer:** That will be interesting. My final question to you is, are you optimistic about the funding review for science?

**Sir Andrew Mackenzie:** I am very positive about the way in which our message has been heard. I am not fully up to date with how the debates are going in the Treasury, but at least I have a sense that I am pushing against an open door and that people have understood the message. That does make me feel on the optimistic side.

Q63 **Graham Stringer:** Lord Browne, we have heard from our first panel of witnesses today that universities have changed their reward system and that the number of spin-out businesses from high-quality fundamental research is improving. You can see that in Cambridge, Manchester—many of our universities. But one of the noticeable differences, if you compare this country and Europe with the United States, is that if you look at all the huge new businesses like Apple, Amazon—you can go through the four or five mega-businesses—they have all been created not in Europe, basically, but in the United States, and some in China, which is a different system. What can we do at that level of business creation—because these mega-businesses are created very quickly—to improve our chances of getting one of those businesses?

**Lord Browne of Madingley:** I would divide the answer into three points. First, we have to be able to retain in this country the fruits of discovery as they are being built into a business, and there are plenty of people competing at very early stages of investment into companies to



grow them. That is the second point—we have to be able to grow them, to scale them. If you look at a past example of two companies that were not unsimilar—Oxbotica in Oxford and Aurora in the United States, both in the autonomous vehicle business—it is remarkable how much more money was attracted by Aurora at every single stage of their funding, because of the scaling, the growth money that is available.

That leads me to a third point, which is that we probably don't have enough people with experience of both sides of that coin—the experience of science and technology and of financing—so that people can see both sides of the issue in order to create the right level of resources in a company. So scaling is very important. This is where we need to make sure that there is a deeper understanding of who does what, at which scale of development of a company. We have discussed this together many times at the science and technology meetings, with the Prime Minister and with other people: we really do think that we need to push hard in this area, to think about how much the state, the nation, takes on as risk and how much reward the nation gets as a result of that risk-taking. There may be room, for example, for more of what you might almost call a sovereign wealth fund in order to do just that—to keep the companies in this country and scale them. It has many benefits. In order to do that, we need the right level of people. In the answers that Andrew gave you to all the questions, it all boils down to just that—the people.

Finally, I would make the point that we are actually doing quite well in some sectors in scaling companies, but when you look at the so-called unicorns that have been created in the UK—it is a very big number: it is third after the US and China—two thirds of them are in FinTech and e-commerce, and one third are in other things. So the leading edge is FinTech and e-commerce, doubtless populated by people who are well-educated and well-honed, mostly in mathematical and finance subjects, through the university system, but we are lacking the number of companies that we could possibly create in other areas. If you look at the record, many of them have gone elsewhere for this scale-up funding. This is where we need to focus. We need to focus on all systems to get scale-up funding.

**Q64 Aaron Bell:** Thank you to all the witnesses. The whole R&D landscape is a dizzying array of road maps, strategies, reviews and all the rest of it. When you last gave evidence to us, Sir Adrian, you described the R&D road map as a general plan in need of specific policies. In what has been published since, such as the innovation strategy, do you feel in a better place in terms of where we are getting to on R&D and the ideas around the pillars of the innovation strategy, with the people and the place that Lord Browne was just talking about?

**Sir Adrian Smith:** To some extent, but I think there is still quite a way to go. Speaking with a Royal Society hat on, if you take the whole net zero agenda, in order to get a concrete grip and handle on it, we have proposed 12 serious headings, with things like heating and lighting of



houses, hydrogen and so forth. In each case, you really want to do an audit of where we are at along the path to a road map. Have we got stuff we can deploy? Have we got stuff that we may need to develop? Or do we not know what we are doing and we need to research? In a sense, you could think of 36 boxes where you could assemble expertise to see where you would get your maximum bang for your buck in the short term. So I think a road map, but we need some petrol stations or something along the way, if you are going to continue that analogy.

**Sir Andrew Mackenzie:** Charging points.

**Sir Adrian Smith:** Yes, very good.

Q65 **Aaron Bell:** You alluded earlier to my question in the last session about the workforce. There is obviously the people and culture strategy as well. Do you feel the Government are doing enough there or do they need to support the implementation of that element of the road map and the strategy further?

**Sir Adrian Smith:** I would think of it in two bits: domestic and international. I still think there is a hell of a lot we need to do to use our influence to improve STEM education and the numbers coming through the pipeline. We have a moment of opportunity, because people have been excited by science post-covid—the discovery of treatments, sequencing of virus genes and so on—but the international bit worries me more. It is back to the signals that we send in various ways, whether through funding or the rhetoric and tone post Brexit.

We are in an internationally competitive environment for talent, and we have to evaluate everything we do against that background. Does it help or hinder? I would like to see a lot more systematic thinking about petty things like visa costs, and the bureaucracy of visas and recruitment. So I think start with being internationally competitive. People are all important and we must pull out all the stops, both domestically and in the way we try and recruit internationally. The words in the people talent strategy are fine and global talent visas are fine, but with the mood music around it, do we feel like a welcoming international country? It is back to signals and I am a bit worried we don't necessarily get those signals right.

Q66 **Aaron Bell:** Turning to Sir Andrew, welcome back and congratulations on your confirmation. As the Chair says, you have had a busy first few weeks with the finance, but how do you see the innovation strategy working with you? Are you happy with the way the innovation strategy has been laid out in the four pillars? Based on the evidence we heard earlier and the whole levelling-up agenda, what role will place play in UKRI's decisions as it makes funding decisions going forward?

**Sir Andrew Mackenzie:** The innovation strategy is very welcome. I was in post early enough to have some input into it. We now need to turn it into something a bit more detailed, particularly for UKRI, and, related to the discussion we are having, perhaps make it clearer about its



relationship to individual sectors, the competitiveness of those sectors and those sectors' ability in many ways to attract private funding. That will absolutely be part of the complementary UKRI strategy that builds on it. It is a tremendous base from which we can grow.

On places and levelling up, it will play a significant part in the way we talk about things. We do have a small fund for places, but we think that we will be able to think about some of the outcomes of getting money from UKRI or investing in UKRI that have to be more related to contributing to the levelling-up agenda. This is not about, for example, taking money away from some of our successes that happen to be in prosperous parts of the country and giving it elsewhere. There is a little bit of that if we have extra money, rather than actually taking money away. We might look to go to the places that perhaps would fit with the overall levelling-up agenda, and we are very much part of that policy development across government.

More significant is to use the spread that we have as UKRI through the universities and a much wider spread through Innovate UK, where we co-fund a lot with industry to get aligned with some of the objectives of levelling up. I brought "Building the Future Economy" a plan for action for UK business innovation, along with me. It just came out yesterday and is one of the things in answer to some earlier questions. This is a summary from Innovate UK, which is one of our councils. A little bit to Mr Stringer's question, we expect that, within this settlement, we will put more emphasis on this in pulling things through so that we start to get that ratio from one to two upwards and it really starts to get the crowdfunding. This is a relatively small endeavour, but it tries to make it much simpler for universities, individuals and companies to see where Government help, in the form of either advice or money, could be made available for the right things to support this agenda. Within that, there will be a levelling-up part.

**Q67 Aaron Bell:** That is good to hear. The outcomes that you have set out are ones we would like to realise. Within the process, will there be any formal consideration of the location of investment that UKRI makes in a funding decision?

**Sir Andrew Mackenzie:** There is. We have a fund for places, which is a few hundred million. That is also with co-funding with industry, and that has a place component. I would emphasise more strongly how the capacity that universities have and the things that UKRI in part underpins could play a big role in the levelling-up agenda. This is part of Ottoline's triple-word score. We might be investing in something that can really push through our ability to benefit from, for example, artificial intelligence, but we will be able to do it perhaps more in a way where there will be a levelling-up spin-off, if I can put it that way.

**Q68 Aaron Bell:** Lord Browne, how will the new National Science and Technology Council be utilised so that the overall R&D landscape, our total UK policies and R&D, is fit for purpose? How do you anticipate the council working with UKRI?



**Lord Browne of Madingley:** First, I believe it is a very important signal to have it there and for it to have its own support staff, which is part of the structuring of Patrick Vallance's organisation and title. It is very important to have a place convened by the Prime Minister that talks about the strategies—they are strategies—specifically on what we will do as a nation to maintain our position as a science superpower in a very competitive environment. That is really important. With the Council on Science and Technology it will remain an independent advisory group—it is independent—to examine what is done for the missions that are set by this particular Cabinet committee. That is a key point.

Obviously, the funding and grant making will be conducted, as Andrew can explain, with UKRI. So I hope that there will be some very interesting benefits. One of the things, for example, that we have been really focused on is what the role of Government is in supporting innovation. Obviously it is funding, and perhaps there is a bigger role in retention of the companies for scaling and maintaining a reward from that, but also from procurement. For example, could the Government become the first customer of companies that are being created? These are big strategic issues, along with the big strategic issue of having the right people in the right places, which is still something that everyone is focused on and which I hope will be maintained as a strategy going forward.

Q69 **Aaron Bell:** Thank you. It is obviously a new Cabinet committee, which is welcome. Do you share Sir Patrick's view that there should be a stronger voice for science within the Cabinet—potentially a dedicated Minister?

**Lord Browne of Madingley:** I do not have a particular view on that. I certainly have a view that there should be a strong voice—if I may add to it—for engineering and science, because it is engineering that grows the fruits of discovery from science. This is a very important point. The United States has taken a particular view there, having a member of the Cabinet as the representative of the science and engineering community. There has to be enough input, I believe—enough input in a way that is understandable and clearly aligned to broader strategies. Science and engineering does not have an independent strategy; it has a strategy that is part of the overall strategy of the nation and how wealth creation takes place. That is something very important for the future of the United Kingdom.

Q70 **Aaron Bell:** Finally, on the council, it is obviously there to serve the whole country but, again, coming back to the place question about complementing the Government's other agendas of building back better and levelling up, is the council very much taking into account those elements of the Government's priorities in the advice it gives to the Prime Minister?

**Lord Browne of Madingley:** Of course, we absolutely do that. We have written to the Prime Minister about levelling up. We are very concerned to make sure that takes place, and it is levelling up that is additional to



what we are doing at the moment. Levelling up does not mean taking and destroying what we have at the moment; it means building on it. My personal view of this is that I believe that if we can crack the scaling-up problem, we can crack quite a lot of the regional problems that we currently have.

**Q71 Aaron Bell:** That is good to hear, but how do you think we crack that problem? It has been a difficult problem. Is it something about venture capital, or is something about the conglomerations of critical mass for the scientists?

**Lord Browne of Madingley:** Science does seem to work with agglomerated centres very well. Engineering does too, to an extent, but scaling up allows you to build growth companies in different parts of the nation. As I have said previously in this session, that requires having the right people in place—people who understand both the science and engineering, and the finance. Secondly, it requires having the risk profile in place, whether that is procurement or the potential of effectively a special and very much bigger fund—a sovereign wealth fund—that invests in companies as they go forward. That is critical. Those things would, I think, catalyse the future, and I hope very much that over time, we will build on those ideas.

**Q72 Rebecca Long Bailey:** Moving quickly on to international collaboration, Sir Andrew, could you let us know how UKRI is managing the implications of overseas development aid cuts?

**Sir Andrew Mackenzie:** Yes. We spoke a little bit about this at my last hearing. Obviously, that was a very difficult pill to swallow. I would simply report that, while unwelcome—in some cases, the cuts were as much as 70%—we have done our best within our existing funding to move forward and move on. As far as I can tell at my level—it may be a little bit superficial, and I will get back to you if you want, if that is not true—we seem to have got through that, unwelcome as it was, and we are moving on to other things now.

**Q73 Rebecca Long Bailey:** Sir Adrian, in your view, is the delay to ratifying the agreement with Horizon Europe causing any issues for the UK R&D sector?

**Sir Adrian Smith:** Increasing anxiety, I think. The longer it goes on, the more difficulties there are. It is not just the Horizon programme itself: it is the Copernicus programme, for example, where, as the timetable extends, we are not able to enter into procurement competitions, and the general level of uncertainty that that creates. Going back to the people issue—recruitment of international talent—it casts a cloud of uncertainty over the whole thing, so the uncertainty is becoming difficult. Anecdotally, we are getting reports of people hesitating to take up post-doc positions and so on because they do not know quite what is happening. Yes, it is a serious problem.

**Q74 Rebecca Long Bailey:** Following on from that point, according to the



Wellcome Trust, the cost of associating with Horizon Europe for 2021-22 was artificially low. Are you concerned that any increase in R&D funds will be diverted to pay for continued association?

**Sir Adrian Smith:** Unless and until I see the cheques in the post, as it were, then yes, again there is considerable anxiety. It is quite complicated to work your way through the implications of what you are paying as a fee for this and what you are going to get back for that. There isn't a clear thing on the table to judge, and as was mentioned in the earlier session, it is not just a question of the funding; it is a question of the relationships, the networks, the mutual use of equipment and the rest. The continuing uncertainty is becoming rather more problematic, and I think we should recognise that.

Q75 **Rebecca Long Bailey:** I have a final question, which I have asked all the panellists today. The Government's ambition is to earmark 2.4% of our GDP for R&D. That is far below other leading industrial nations, which are at about 3% at the moment. Do you think that the Government's ambition is far too low? I will start with you, Sir Adrian.

**Sir Adrian Smith:** The latest figures—the hard numbers from 2019—were 1.74%, so up to 2.4%. You would have to cheer, wouldn't you? That would be good, but do not forget that 2.4% was itself an OECD average from five years ago, and the OECD average is now 2.7% or 2.8%. Other countries are heading for 3% or 4%, but let's not be curmudgeonly if we could get that commitment—£22 billion by 2024, an upwards slope heading towards 2.4%—and get all the signals right, because we will not get to 2.4% unless we increase that private investment, as John and others have said.

**Sir Andrew Mackenzie:** I would basically echo everything that Adrian has said. The benchmarks are moving up as the world sees the ability to be more competitive stemming more and more from research and development, with the appropriate level of co-funding from Government sources. It would be great to keep on that pathway, but we have to acknowledge that when you look at the announcements from around the world, this is a very competitive landscape. It is competitive for private sector money that will crowd in alongside public money, and it is a competition for talent.

**Lord Browne of Madingley:** Since 2008, the percentage has gone from 1.5% to 1.75%, so that is pretty slow. To take it to 2.4% would be a great achievement, but an essential one. We've got to add roughly 50% to what we are doing to be competitive as a science superpower. We need to get there first, and then we probably need to go further from that point, but it means accelerating the rate of change very significantly: 1.5% to 1.75% over 13 years is one thing. We now have to get to 2.4%, so it is a pretty good landing stage in the first instance.

Q76 **Graham Stringer:** Sir Adrian, you made the point that it is difficult to follow the funding through some of these areas, and it is. Immediately



after the decision to leave the European Union was taken, there was a view from much of the scientific community that, although we were net beneficiaries of the Horizon programme, when you looked at funding for science through the European regional development fund, we were losing on that. Has there been a follow-up to that? Have we received the money back into science from the regional development funding, in a very simple sense, to replace the net loss on the Horizon programme?

**Sir Adrian Smith:** That is a really interesting question, and one to which not enough attention is being paid. When we were in the EU, you could combine Horizon research funds with funding that you bid for from the regional and structural funds, and many areas of the UK played that game absolutely superbly: the east midlands, Northern Ireland and so on. Whatever happens with Horizon, we will not of course have access to the regional and structural funds.

We have this thing that we have created called the shared prosperity fund, but it remains, to me, a slight mystery as to what the scale of that is going to be and how it is going to interact with the research base. Is it located in the Department for Levelling Up, Housing and Communities? How do you get the combination? Part of the levelling-up agenda is precisely that you need to be able to combine that sort of structural funding separately from the research funding. You do not want to muddy the waters; the research funding should be for excellent research. However, you need to combine it with some kind of regional thing. That is still something to be bottomed out in this country.

Q77 **Chris Clarkson:** I have a couple of quick questions. The first is to you, Sir Adrian. In your review of frameworks on international collaboration, you suggested an agility fund. I want your thoughts on how that would work in terms of top-down international collaboration.

**Sir Adrian Smith:** I go back to the point that Graeme Reid and I made in that report: we lack something that you might call an agility fund. Just anecdotally, as director of Turing I get approaches from people around the world: could we collaborate on this, that and the other? You could do great things with £10 million, but there is no sofa down the back of which to find the £10 million to react to these potential co-operative opportunities. That is still a missing chunk in the landscape. Perhaps something like that might exist within UKRI going forward—I cannot speak for Andrew—but we do lack something there.

Of course, post Brexit, we are still in the process of asking what the global positioning of the UK is going to be. What new partnerships do we want to build? If we are going to do that, there has to be a fund that we can draw on. So there is a missing link: an agility fund.

Q78 **Chris Clarkson:** Almost a contingency plan for inspiration. My last question is for all three witnesses, and it is a nice open-ended one. What other forms of international collaboration for R&D should the Government pursue? I will start with you, Lord Browne, and then I will take Sir



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Andrew and Sir Adrian.

**Lord Browne:** First, let me say that international collaboration, to state the obvious, is absolutely essential. While we are very good, we do not have a 100% call on the best brains in the world or the best facilities, although we have quite a few of them. It seems to me that the big global challenges are the things to really focus on, because they are the easier things to collaborate on. Global climate change and security threats are the two things that immediately come to mind.

It is essential that we keep building. Strangely, they can also be built through business and with business. Business will tend to look at things first on quality—can you actually do something that is different and better?—and probably second on the incremental cost thereof. It might just be slightly more expensive to do it internationally, but if the result is much better, then they would go for that.

**Sir Andrew Mackenzie:** Just to add to that, clearly as the country has now embarked on a whole range of trade negotiations with many countries around the world, I would be keen to see, within those trade settlements, agreements to collaborate more on technology. I have seen some of them come through recently, and I have tried to leverage them on behalf of UKRI. They tend to be quite far down. We speak a lot about Horizon, but it is not just about the EU. It is particularly important that we collaborate more with rapidly industrialising Asia, who are investing enormous amounts. They tend to lead some of the league tables on percentage GDP, but if we can collaborate with that, we can certainly do more. That would be my principal recommendation.

I agree with John Browne that it is a statement of the obvious that we should collaborate on something like net zero, and very often, in order to prove up some of those things, we need to be able to show scale in other markets. We cannot solve climate change by just making the UK carbon neutral. If our gift to the rest of the world is through technical collaboration, we actually bend the trend in other countries' approach to net zero. We will do a great thing for the climate and we will create the opportunity for industry and global supply chains to be disproportionate located here in the UK. I think the bottom line is that collaborating technically should be much higher up when we are negotiating trade agreements.

By the way, as someone who has worked internationally, it is great calling card to be a British scientist. I have gone into rooms in places like Japan and China, and they have noticed that I am a member of the Royal Society and have decided that it is more interesting to talk to me about that than the reason I came to talk to them in the first place, which was probably to sell them something like iron ore.

**Sir Adrian Smith:** It has all been said, in a sense, but I will just add one more ingredient. If you look at the global challenges, whether that is climate, pandemics and all the rest of it, data is fundamentally important,



as I think we learnt in the early stages of covid. Data sharing to address these global challenges is going to be increasingly important, and the use of data and the ubiquitous spread of artificial intelligence leads to issues about standards. If you are going to have products based on artificial intelligence, what are the international standards that would underlie fair trade? That is just a little addendum; everything that was said before is obviously right.

**Q79 Chair:** I have a couple of final questions to finish off with. Lord Browne, you chair the Prime Minister's Council for Science and Technology, which brings together some very eminent UK scientists and reports directly to the Prime Minister. When was the last time the Prime Minister attended a discussion of the CST?

**Lord Browne of Madingley:** It was June, and I was pleased to see that the Prime Minister was taking notes, which was very good. He commissioned additional work on this whole question of scaling up. We were very concerned that we needed to have a commissioned piece of work, and we have written to him on that matter now.

**Q80 Chair:** Excellent. In that discussion, did you touch on some of the things that we have been talking about today, such as the future of science funding and its importance in leveraging money from the private sector?

**Lord Browne of Madingley:** Absolutely. We have written to him on four topics—health, science superpower, innovation and levelling up—so we actually scooped up all the points there. One of the very big points, of course, is that we, in our letter on science superpower, said that we had to increase funding by 50%—not just in Government circles, but in business and industry.

**Q81 Chair:** Can I ask the same about the Chancellor? Has the CST had a meeting that the Chancellor has been a part of?

**Lord Browne of Madingley:** I have only been co-chair since the middle of the year—before the meeting with the Prime Minister. We invited the Chancellor, but he couldn't make it because he was away—I forget. But he has committed to coming to a forthcoming meeting.

**Q82 Chair:** Thank you very much indeed. Finally to Sir Andrew, I don't know whether you heard the first session in which Dame Nancy and Sir John were talking about some aspects of the UKRI structure that had proved valuable. In particular, levelling up has been talked about, as have the Strength in Places fund and the Industrial Strategy Challenge fund. Whether or not they have those names, do you expect those concepts to continue as part of the new settlement.

**Sir Andrew Mackenzie:** I don't know the detail, but I think the principle behind those things will definitely continue. Once we get our settlement, how we allocate things and the best way to do things will be a matter for the UKRI organisation—



Q83 **Chair:** It won't need to be agreed with the Treasury or with BEIS; it's in your sole discretion, is it?

**Sir Andrew Mackenzie:** We will have to see the extent to which there is a ringfencing of certain things. Certainly, part of my argument and submission is keeping that to a minimum, so that we have the flexibility to make the best use of those funds and build on the success of what we have done previously, if you have heard that in the first session. We will wait and see. We have certainly asked to avoid the problem of not having the flexibility to do what you say and what I am offering to do.

Q84 **Chair:** Very finally, you have just been appointed. You were the Government's choice and nomination to be Chair of UKRI. You have a very distinguished business and, indeed, scientific background. I will put it this way: you are at your point of maximum power. You have been appointed and are not awaiting reappointment—not that that would influence you, I am sure. They want you and have placed their faith in you. You have described conversations in which you said you were listened to. Are you exercising that power? Are you being muscular in those conversations?

**Sir Andrew Mackenzie:** I believe so, yes.

Q85 **Chair:** Give us a flavour of how you are wielding your power.

**Sir Andrew Mackenzie:** I can reassure all members of the Committee that I have conveyed the messages you have heard from the three of us—and the earlier session, which I listened to—persistently and forcefully, to the extent that they are relevant.

Q86 **Chair:** With menace?

**Sir Andrew Mackenzie:** Probably not with menace, because ultimately I want them to realise that I will be a loyal servant once they have listened to me, but I have not pussyfooted around, if that is what you are thinking. I have said it very strongly and repeatedly sent messages into the Treasury and No. 10 in particular. I felt less need to do so with BEIS, where I felt a strong resonance very early on with what we were trying to achieve, and a real belief that this was not about a grant, but investment-enabling activity that they should get behind. Clearly, it ran into a little bit more questioning when people had to make all the numbers work in Treasury. I have certainly been using that power and, to some extent, not only that, but pledging my commitment and, hopefully, some of my experience to deliver for them, if they place more faith in us in the years to come.

Q87 **Chair:** So the Treasury is the target—if not for menace, then certainly for effective diplomacy?

**Sir Andrew Mackenzie:** Well, there are meetings still to happen at the highest levels, I should say. They are in the diary.

Q88 **Chair:** There are meetings still to happen? So it is still all to play for, with



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a week to go?

**Sir Andrew Mackenzie:** I do not think so. I say that as part of the strength of the relationship—we are kept in the loop.

Q89 **Chair:** We hope you will go to those meetings feeling strong and persuasively diplomatic. In my experience, money moves around up until the night before in Budget discussions. Your role is very important.

**Sir Andrew Mackenzie:** They are in the diary.

**Chair:** I hope they will be kept. You have an important independent role as Chair of UKRI. The UK science community looks to you as their independent champion in many respects. We do not see what is going on in those rooms, but we wish you Godspeed.

We are grateful to our witnesses on this panel—Sir Andrew, Sir Adrian and Lord Browne—and indeed to all our witnesses this morning, as well as our distinguished representatives from the Crick, who have stayed the course through all three sessions. We are very grateful to everyone who has attended. We will write to the Prime Minister and the Secretary of State with some distillation of what we have heard, in what has been an important and fascinating session this morning. That concludes this meeting of the Science and Technology Committee.