



Science and Technology Committee

Corrected oral evidence: People and skills in UK science, technology, engineering and mathematics

Tuesday 6 September 2022

10.15 am

[Watch the meeting](#)

Members present: Baroness Brown of Cambridge (The Chair); Baroness Blackwood of North Oxford; Viscount Hanworth; Lord Holmes of Richmond; Lord Mitchell; Lord Rees of Ludlow; Baroness Rock; Baroness Sheehan; Baroness Warwick of Undercliffe; Lord Wei; Lord Winston.

Evidence Session No. 1

Heard in Public

Questions 1 - 9

Witnesses

Professor Dame Ottoline Leyser, Chief Executive Officer, UK Research and Innovation; Harry Anderson, Policy Manager, Universities UK; Professor Maggie Dallman OBE, Vice President (International) and Associate Provost (Academic Partnerships), Imperial College London.

USE OF THE TRANSCRIPT

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

Examination of witnesses

Professor Dame Ottoline Leyser, Harry Anderson and Professor Maggie Dallman.

Q1 The Chair: Good morning. It is a great pleasure to welcome our witnesses this morning to the committee's first evidence session for our new inquiry into people and skills in STEM in the UK. It is a great pleasure to have as our witnesses Professor Maggie Dallman, Professor Dame Ottoline Leyser and Harry Anderson.

The session is being broadcast live on Parliament TV. A full transcript is being taken, which will be made available to our witnesses shortly after the meeting so that they can make any minor corrections if they wish to do so. Should any of our witnesses think of anything that they wish they had said to us or did not quite manage to get in, we would be delighted to receive written evidence from them after this session.

Let me kick off with the first question. Before I do so, I must declare my interest as the chair of STEM Learning Ltd. We are interested to understand how attractive the UK is now for people with STEM skills to come to; whether that perception of the UK among people overseas has changed recently; whether that is affecting the ability of universities, for example, to recruit and attract highly skilled scientists from overseas; and, indeed, whether we are losing out on our market share of such talent internationally. If so, who are the main competitors for this talent and what are they doing better than us?

Professor Dallman: Thanks for inviting me along to give evidence on this very important subject for the UK. In terms of attractiveness, Imperial is currently experiencing some challenges when recruiting. We are able to fill the roles overall but we are seeing fewer applicants, more negotiations that fail and more questions about what it is like and what it will be like in the UK. This suggests that the attractiveness of the UK as a destination for scientists might have decreased in recent years. This is true across the board but is particularly acute for clinical and non-clinical medicine and engineering¹.

There is a further particular difficulty in attracting a truly diverse staff population. We have about 47% female staff at Imperial College but only 39% of research staff are female. Remarkably badly, if you like, we have fewer than five black academic staff on our books at the moment. On the professional support services side, the higher up the ladder you get, the fewer BAME applicants and people there are.

I have to say, the attractiveness of the UK as a destination to study and research STEM-based subjects comes up quite often in discussion with colleagues. Sadly, it is generally felt from the outside that the UK appears to be somewhat parochial and unattractive. There are a number of factors that contribute to this.

¹ Referring to the recruitment of staff, the challenges are particularly acute in these areas.

First, the messaging on welcoming highly skilled scientists to the UK is increasingly drowned out by post-Brexit rhetoric and policy to reduce overall immigration to the UK. Academics are very open people and do not want to hear that about how people feel about us.

Secondly, for us, the university financial model is driving a change in the balance between time for research and teaching at the moment, and is becoming less attractive to those who have strong research careers.

Thirdly, the current situation with the USS pensions is a major nightmare. There is huge concern about where that is going to end up. The cost of living, particularly in universities associated with being in London and the south-east, is becoming almost prohibitively high.

Some 60% of our students come from outside the UK, including 20% from other European countries. Those international students make a fantastic contribution to the culture but also the brilliance of UK science. The number of applicants that we are seeing from the EEA has, not surprisingly, decreased significantly in the last few years because students from other European countries now count for international fee status, not home fee status, and there is a huge difference—threefold, in many cases—in the level of fee. This is not unique to Imperial; this is in line with the rest of the sector. The numbers are stark. Between 2019 and 2021, there was a 50% decline, with a further decline in 2022².

It is important for us to remember that other European students have a lot of choice in other universities that they go to, many of which, although English is perhaps not the first language of the country, are now teaching in English and charge ridiculously low fees. ETH Zurich, which by any measure is a fantastic international research university, is charging students £1,400 a year. We simply cannot compete with that.

US universities look more expensive at first but, generally, their scholarships are much more generous than those in the UK. I am a governor at a couple of schools where the brightest students are now looking to go to the USA for their undergraduate degree programmes, rather than coming to UK universities, which is a big change in the last few years. This ambition is growing among a lot of schools.

To try to combat this, we have invested in studentships and scholarships for international students at Imperial. We are very grateful for those scholarships that the Government fund, but it might be a great idea to increase the number of those sorts of scholarships that are available.

I have talked a little about the main competitors for students. Many of the universities in Asia are not competing in terms of rankings at the moment, but it is interesting how quickly they are moving up the rankings tables in THE and QS, for instance. Asian universities are going to be a big draw for our students shortly³.

² Just to note this figure is the sector average, which Imperial is broadly in line with

³ As in will compete with the same pool of talented UK-based and international students, rather than directly taking current Imperial students.

In terms of staff, looking at personal remuneration, we have done a big benchmarking study recently. For our academic staff, we are competing very well in Europe—with the exception of ETH Zurich, which seems to manage to pay its staff much more than we can. That personal package is okay against the US if you take everything into account but the lab start-up packages are often much higher in the US and the facilities are just fantastic. Although there are some aspects of the research culture that we lead on, that is not always at the top of people's priorities.

There are going to be some real shifts in the rankings of Asian universities, which will make them much more attractive to staff. We are already seeing that with recruitment, primarily that of expats back to universities in Asia. That is going to continue to challenge us.

The Chair: Can I move on to Dame Ottoline and UKRI perhaps to talk a bit more about the researcher level and also what UKRI is going to be able to do to help with this situation—or what you would like to be able to do, anyway?

Professor Dame Ottoline Leyser: Absolutely. I agree with Maggie that this is a pivotal time. There is a huge amount of instability globally, in all kinds of contexts. Research and innovation is one of those things, so it is absolutely critical that the UK signals really clearly and loudly, with long-term commitments from a funding point of view, its intention to drive up research and innovation investment and opportunity right across the UK economy. It is the only credible way to build the kind of sustainable, resilient, high-growth, high-productivity economy that will provide the high-quality jobs and the high-quality public services that the UK needs. It is a critical time right now. We have that opportunity. We have a long and strong track record but, if we are in the slightest bit complacent now, we will lose that fast.

As Maggie said, the research and innovation community is incredibly international and the circulation of people through that internationally is a very important element for the way it works. The idea of people leaving the UK to go to other countries is a good thing, as long as people are also coming back in. We are not interested in stopping movement; we are interested in promoting dynamic movement internationally, with the right circulation and high-quality people locating to the UK.

That is across a whole range of skills. The other thing that happens in this debate is a tendency to make blanket statements when the issues are very different for students, technicians, apprentices, PhD students, early-career researchers and those more senior appointments. It is really important to be data-driven on all of those. I would emphasise that the attractiveness is quite complex. It is not just about salary, by any means. It is about opportunity in a whole variety of ways.

What are we doing at UKRI? We are doing quite a lot of different things. The first is to promote the full range of careers in research and innovation and try to connect up better the research and innovation system to drive circulation within the UK but also internationally across that. This could be, for example, between academia and business, between the third sector and the public and private sectors, or between the investor

community and the research community. That join-up is critical. A lot of our skills interventions are increasingly to do with driving that connectivity, and that includes international.

We have opened our PhD studentships to international students. That saw a massive increase—43%—in applications from international students the year we did that. They are still extremely competitive. There is a shift, absolutely, from the EU to the rest of the world but we still have the opportunity to keep that international circulation through those kinds of offers. People will have seen that we have recently increased the stipend of our PhD studentships; part of the driver for that was certainly to keep pace with international competitors, recognising that the stipend is only one element of that.

We have a number of very competitive fellowship schemes that are extraordinarily good at attracting and retaining non-UK nationals. The fellowship programme is really important, as is, in all cases, embedding those things in the wider research and innovation system to keep people and their skills and ideas here but move them around the UK economy. There are then also more senior fellowships available and our ongoing grant funding programmes, infrastructure investment and so on.

The opportunity from UKRI bringing together all the disciplines and sectors is to create that really balanced portfolio of investments that creates and builds the really attractive ecosystem that the UK needs to bring people in and keep them here. There is everything to play for but we have to play hard because it is a very competitive world out there. Smart investment to build that attractive environment for research—the culture for research that allows people to come here and pursue their ideas freely—is something that is critical to keeping the vibrant community that we currently have.

The Chair: Do you have enough flexibility with UKRI funds to be able to respond to an issue like this, or is there something that would help you respond even more strongly?

Professor Dame Ottoline Leyser: Flexibility is critical. I have argued all along that we absolutely need the money and the investment, and we need that to be clearly rising and stable, but we also need the flexibility to invest it dynamically so that every pound can do multiple things. It can drive the skills agenda but also the levelling-up agenda, the technology and competitiveness agenda and the high-quality infrastructure that we need. Again, that is our advantage. Because we have that full range of responsibilities, we can build the balanced portfolio of investment that we need. We absolutely need flexibility to be able to do that. It is critical.

Harry Anderson: Universities really welcome the science superpower narrative because it builds on a lot of the points that we have been hearing about in terms of that certainty, that stability and that long-term funding commitment. When you are looking at other countries that do well, it is a positively reinforcing cycle. Being attractive to talent then makes you more attractive to talent going forward.

We are a very international sector already; a third of staff are international. That has been increasing over the last five years, albeit the rate at which it is increasing from EU nationals is much lower than from non-EU ones. We need to consider the impacts of Brexit on how attractive we are perceived to be.

The key question I have is about whether we are growing at the rate we need to. The Government have already acknowledged that we need 150,000 more people working in STEM, in science and technology. My question is about whether we are on that trajectory. Are we going to meet those targets as we want to?

There have been some really positive developments across the higher education sector. I want to highlight three very briefly. The Global Talent visa has been really impactful for our universities. The Graduate route enables us to retain the talent that UK universities have invested in over the last three, four or five years.

Also, a recent development is the GREAT talent campaign. We have been talking to Government about this. Looking at other countries, there is Research in Germany. It is a really great platform that enables overseas talent who are thinking about relocating to Germany to find everything in a one-stop shop platform. We have managed to develop a UK version of that but, at the moment, it is perhaps a bit too promotional rather than practical. There is practical information that researchers and anyone who is looking to work in STEM would like to access.

Those are the three I would highlight. There is plenty more on the immigration and visa fronts we could look to explore, too, but I will leave it there.

The Chair: We will pick up on some of those issues as we go forward.

Q2 **Baroness Warwick of Undercliffe:** Thank you all for coming. I am going to follow up on that because you have all painted what sounds to me like a combination of factors that produce a really alarming situation. It is something that the Government need to be extraordinarily concerned about, as I know we are.

We have talked about the problems in even beginning to get people to think about coming to the UK. If we have managed to get over some of those and people are beginning to think, "The UK might be an environment that I would like to be part of", what challenges face scientists and people with STEM skills seeking to move to the UK, and what can be done to address these? I will ask you each in turn but, Dame Ottoline, could you comment particularly on the success of the Ernest Rutherford fellowships and whether there are particular aspects of the scheme that have made them successful? Perhaps we could start with you then pick up the other issues.

Professor Dame Ottoline Leyser: I would echo that the visa issue is rather critical, particularly the expense of the health surcharge, which people wishing to move to the UK have to pay up front at the time they enter for the length of their visa. If you are a family of four coming on a

five-year visa, that stacks up to a serious sum of money that you personally have to pay on the day you arrive. That is quite inhibitory, so that would be a key intervention.

In terms of the Ernest Rutherford fellowship scheme, it is one of many fellowship schemes we offer, all of which are very attractive to international researchers. It is actually quite a small scheme that is focused on people in the particle physics and high-energy physics community in general. It awards about 10 fellowships a year. About half of those are to overseas people. It is a very successful fellowship scheme in terms of that early-career element that bridges people from the post-doctoral phase into their independent research career phase. As I say, it has been very successful but it is one of several schemes. For example, our future leaders fellowship scheme is another one of our flagship fellowship schemes. It is very successful at attracting and retaining international applicants.

The offers we have in general across the UK are still very competitive and good at attracting in overseas people. Our issue is that we are very much on the cusp. It is that set of intangibles that we need to ensure we are really driving forward to maintain and continue our competitiveness. There are particular issues in the UK but this is a global issue about the attractiveness of research careers. It is another reason why these issues around research culture are so important in creating exciting career opportunities for the brightest and the best, and indeed for the highly skilled and technically motivated.

All those people are absolutely critical to creating the overall environment that we need, and they all feed off one another. Focusing on one sort of person is not a good idea. We have to focus on the whole system. Again, that is the opportunity UKRI has because we reach across all of it to build the kind of place that is a magnet for talent.

Baroness Warwick of Undercliffe: You have said that the Ernest Rutherford scheme is one among many. Are there any particular ones that you see have been so successful that they are worth expanding, or do you feel that each is developing a rather niche but very helpful approach?

Professor Dame Ottoline Leyser: We are at an interesting time in the overall fellowship programme. One of the things we have done in our new spending review allocation is to create a pooled talent budget. We put all of those talent offers together in one integrated budget. We will work, over the next three years, towards balancing that portfolio overall and making sure that it provides a coherent and attractive set of options for people from the UK and from around the world.

As research and innovation becomes more and more interdisciplinary, creating these flexible fellowships that are broadly interdisciplinary is going to be critical to retaining our attractiveness. We absolutely can learn from the individual successes of the fellowship programmes we have at the moment but they have tended, until the future leaders fellowships at any rate, to be focused on the particular disciplinary areas that are traditional. We need to maintain, support and bolster those

disciplines—they are critical—in a way that is sufficiently flexible so that people can move between them when they need and want to.

Professor Dallman: I have little to add other than to underscore the point about the entire ecosystem. This has to function for us to be a world-leading science and technology power. Getting it right across the whole ecosystem is challenging and expensive but we believe that the investment will be there. That needs to be maintained.

I might even suggest that, with the new Government, a welcome piece of information would be whether there is a Science Minister who focuses on the importance of this for the UK, because it is fragile. As Ottoline said, we are on the cusp and it is very fragile at the moment; it could go either way. Obviously we want to do everything we can to ensure that it goes in a positive direction because it would be a huge loss for the UK if we lost the huge momentum and excellence that we have in this area.

Q3 **Baroness Blackwood of North Oxford:** Thank you for the evidence so far; it has been fascinating. We have heard a lot about how competitive recruiting the best scientists and technologists is. What can the UK learn from the steps taken by other countries to attract and incentivise STEM talent? We have heard some examples of what the UK is doing well and what other countries are doing well. I just wonder if there are any gaps where we could do better and where other countries are doing well.

In particular, given the cost of living crisis, do you have any evidence on, for example, the rate of pay for students, post-docs and early-career researchers? Is it competitive with other countries? Is it commonly cited as an incentive for scientists? Is there something that we can do to improve the situation?

Harry Anderson: There certainly are places that we can look to around the world. Quite often, when you talk to our university members, two quite specific examples come out, one of which is Singapore's A*STAR. It is a public R&D agency that plays a key role in nurturing and developing talent and research leaders, and also works very closely with industry in Singapore. That is one example that our university members have highlighted to us.

The second is Canada's Mitacs funding agency, which also runs Globalink, a research internship programme. A point that we have heard already is about brain circulation being quite an important concept within the R&D landscape. Although we always want to attract and retain talent, it is really important that, if the UK is to become a leading science nation and a science superpower, we establish links and connections with emerging economies and other parts of the world where we feel that having good research links is going to be positive in the long run.

Those are two examples that have been cited by our members. I would just say that we probably cannot do a quick fix here. It is not as if we can look at another country and just copy and paste a scheme and hope that that shifts the dial. It needs to be a strategy. It needs to be joined up. It needs to have long-term commitments so that, if you are a top

researcher, technician or anyone who is interested in a STEM career and you are thinking about the UK, you have stability and certainty that coming to the UK is going to be a very good choice for your career and future progression.

One final point I would make is that, if we are looking at international comparisons, I would really emphasise the point that Ottoline made about visa costs. We have a new Government. We will have a new Home Secretary. Visa policy is completely in the gift of this Government now. If we really want to be attractive, I would encourage us to look at those leading science nations and benchmark ourselves to what their visa costs are. We have heard about the immigration health surcharge but it is not just that. The overall application fee, particularly if you are bringing families, is overly prohibitive. That is something in our gift that we can change quite quickly.

Professor Dame Ottoline Leyser: It is always important to look overseas, and we continually do so, but I agree with Harry that it is tricky to make the comparisons because everything is different, if you see what I mean. The critical, rate-limiting step is different in different countries.

In terms of motivation, things such as salary, pay and benefits are important but they are not the main motivator for most researchers. They are interested in their freedom to pursue their ideas—whether they will be able to access funding to pursue them easily—the opportunities they have for their career development, either in the academic or business communities or both, in a complex way, and the wider supporting environment in which they are working. Will they have the right technical and administrative support? Will they have the right equipment and facilities? How easy will it be for them to access those things? Building that attractive system that sucks people in and keeps them here is critical.

There are pragmatic things one can do with visas. Cost is one. The other is to do with the long-term prospects. For example, we are in the middle of a consultation on the new deal for PhD students; it is really a zoom-out consideration of what a PhD studentship or experience should ideally be like. In the responses to that, people were mostly concerned about tuition fees for international students, migration expenses and visas, but also the fact that the three or four years you spend for study does not count towards your clock on indefinite leave to remain in the UK. That is about career opportunity. People are asking themselves, “If I come to the UK with my skills, what will my opportunities be?” That is a critical question we need to think about.

Baroness Blackwood of North Oxford: Is UKRI looking closely at how the cost of living may affect the retention of some of the best scientists within our system?

Professor Dame Ottoline Leyser: Absolutely. We have a lot of work ongoing about overall sustainability, particularly in the university sector. There is this rising set of anxieties that are coming together in a perfect storm. That is one of the reasons why now is such a pivotal moment for long-term stable messaging and investment about our research and

innovation system, and about connecting it up to ensure that everybody has that full range of opportunities. It is very difficult.

For example, a key driver in the cost of living issue is fuel. That is not only affecting PhD students, technicians and all the professional administrative staff and researchers. It affects everybody individually but it also affects some of our big research facilities, which are incredibly energy-intensive. All of the costs right across the system will be going up, and although we are extremely grateful for the spending review settlement we got, which rises year on year, the increases we have will be completely consumed by inflation unless inflation can be brought under control, fuel prices can be protected in some way and we continue to invest in a really convincing way.

We cannot emphasise this pivotal moment enough. I realise that there are huge economic pressures across the country but you cannot do stop-start investment in science. It completely destroys the pipeline but also undermines people's confidence in business, where there is massive pent-up investment opportunity. It undermines confidence that we are serious about this, and it goes very rapidly overseas. Now is the moment.

Baroness Blackwood of North Oxford: Does UKRI have any immediate proposals to make sure that, during this autumn, we do not lose any students, post-docs or academics due to the cost of living?

Professor Dame Ottoline Leyser: You will have seen that we have just increased our student stipends from 1 October 2022 by 10%, which is in response to a whole variety of pressures. We are not the employers of any of the staff who are funded on grants so we are not in a position to increase the salaries of post-doctoral researchers in universities, for example.

How we might be able to absorb the pay increases that might come in negotiation with universities across the country is a very difficult one because our overall funding envelope is the same this year as it was last year, basically. If we need to absorb that across our whole portfolio, it would essentially result in a massive constraint on our ability to fund anything new, which, as I have mentioned, would be quite disastrous from the point of view of the long-term system. The cost of living situation is relevant right across the economy, and I appreciate that the Government are working hard to try to understand how best to address that across the whole economy.

Q4 **Baroness Rock:** You have already talked a little bit about the visa system. I would like to dig into a little bit more detail on it and what is appropriate for the visa system. Professor Maggie Dallman, what are the biggest factors deterring people from applying for visas? We have also heard of attempts from the Home Office to attract talented individuals, for example a fast-track system for those in receipt of certain awards or visas granted on the basis of graduating from top-ranked universities. Are these criteria appropriate for the UK?

Professor Maggie Dallman: There have been some welcome changes to the immigration system in recent years, for example the global talent

visa, which helps fast-track the visa process. I would emphasise, as we have heard already, that the cost of getting this all in place before you arrive is quite high. It is much higher than in any other country and is very unwelcoming. That is perhaps even more important than the cost. You have this huge upfront barrier to overcome. The US H-1B visa is something that is interesting to follow.

Having said all that, the visa reform has been really successful for us at Imperial. We have 229 staff on the new science visa, up from 86 in 2021. The data is there to suggest that this is relevant and important, but it is just another thing that is not welcoming and a barrier. In terms of fast-tracking, that would be welcome. We have the global talent visa; anything to substantiate that further would be useful. There was a part of the question relating to a potential concierge system. Again, all of these things are welcome and appropriate.

Baroness Rock: Harry, I wondered whether you had anything to add on that, as I know this is something you have touched on.

Harry Anderson: I would really emphasise that it is the upfront nature of our visa system that proves detrimental to many applicants who are looking to move to the UK. There are a couple of examples that might be of interest to the committee. In the course of some of the research that we have been doing at UUK, we came across two examples. One is that academics are actually asking for shorter contracts because the upfront cost is so much that, instead of having to pay for a five-year visa, they would rather come here for two or three years because that makes it more affordable.

Another example that really stuck with me was that of a Turkish academic looking to come to the UK. They were the only applicant for this role, so the university was not able to find another that they thought was suitable, but the upfront cost of them moving to the UK ended up being 10 times their salary back in Turkey. If they are required to do that just to come to the UK, let alone every other issue about how attractive we are, that is a real challenge and barrier. A lot of universities put in loan repayment schemes and will help with those upfront costs, but that is not something that every university can do across the sector. That really is a challenge that we face.

Q5 Lord Rees of Ludlow: I want to ask about the intrusion of international tensions, especially with China, because we know that the Chinese contingent is the largest in terms of student numbers at Imperial and elsewhere. How vulnerable is that, and what should our attitude be towards that number?

Professor Maggie Dallman: You are absolutely right to highlight this. It is a real issue that we are concerned about. If that got turned off tomorrow and the students got turned off tomorrow, it would be a very uncomfortable place financially, but also in terms of the great students that we get from China.

Lord Rees of Ludlow: It would be short-sighted.

Professor Maggie Dallman: It would be very short-sighted. Obviously we might have some influence on one side and considerably less on the other, but the rhetoric at the moment is very worrying.

Professor Dame Ottoline Leyser: I was just going to flag that, in the context of the visa scheme, there is the ATAS system, which attempts to mitigate that. If that system could work more rapidly, we would welcome that as an approach to navigating this landscape. The entire system is keen to be as open as possible but absolutely to reflect, respect and protect our national security. Navigating that path is really critical.

Harry Anderson: I would also completely reinforce that point around ATAS. ATAS can prove quite a big barrier for both students and staff, but it provides really good protection for the UK. We are not against ATAS but it could be made to work more efficiently and quicker.

Just going back to the point around China in particular, one of the reasons why UK universities have been so pleased with the Graduate route is that it facilitates greater diversification of international students. If you look at the latest quarterly migration stats that have come from the Home Office, applications from India have now overtaken China for the first time in probably close to a decade. I doubt that there is a university in this country that is not thinking about diversification very seriously.

Q6 **Lord Mitchell:** I would first of all like to declare that I am an investor in and director of a company that is involved in tech recruitment. On a personal basis, I also have to declare that I have a son who is a brain drainee, if that is the word, to the United States so I have a very personal interest in this.

Is there any evidence of a brain drain from the UK in STEM fields, for example in medicine and among early-career researchers? Should consideration be given to schemes to incentivise skilled individuals to return to the UK from abroad, for example to work in the NHS but other areas as well? Just because somebody leaves the UK does not mean they might not want to come back. They may have elderly parents. Their partners might want to come back. They might be homesick. Careers opportunities change. It seems to me that barriers are put up to people coming back when we should actively welcome them back to this country, and there are no visa costs.

Professor Dame Ottoline Leyser: In terms of evidence, it is difficult. We are on the cusp. If you look at the national diversity of people in our R&I system, it has been quite stable for quite a long time and there is not yet any evidence of a reduction, but we are hearing a lot of evidence coming out of employers that it is getting harder. Now is the moment to act.

That circulation of brains is absolutely critical. We want to do things to encourage UK researchers to go overseas, but then absolutely to encourage them to come back. I worked in the US for a number of years and I am sure that it was extraordinarily good for my research abilities,

my career and my networking. I had a fellowship that paid for me to go to the US and then paid for me to come back again. If we see that kind of problem emerging, absolutely there are ways to make it really easy for people to come back.

The evidence that there are barriers for people to come back is not clear. Certainly in the academic system, it is positively welcomed if people have had overseas experience, so it actually helps you in your career in an academic context. The differences between the venture capital and SME community in the UK versus the US are clearly of concern in terms of people who wish to start and then scale companies. That is something that I know there is a lot of interest in supporting right across government. I am sure that your expertise in that area is invaluable.

Professor Maggie Dallman: I briefly alluded to this earlier. It is not a massive brain drain at the moment. There is no evidence of that, as has already been said, but we have certainly seen Asian countries competing much more aggressively with attractive packages, often for expats' return to the country. They are often those people with highly desirable technical and computing skills. We just have to be wary of that. There is an increase in the number of those people whom we very much value as part of our academic community being sucked back to their own countries. I suppose that we should not object to that if we are trying to bring expats back to our country but it is definitely out there.

Harry Anderson: The only point I would add is that, if you are looking at the numbers of staff working in STEM disciplines in universities over the last five years, we have seen that number increase. It is a point I mentioned at the start, but it is perhaps a question of whether that increase is at the rate we need in terms of fulfilling our ambitions as a science superpower.

I have mentioned it already but I encourage the committee to look at Canada's Globalink programme, which is specifically designed to encourage the movement of PhD students and early-career researchers in particular to build those kinds of connections. It is absolutely not just about keeping hold of talent. That brain circulation point is crucial.

Professor Dame Ottoline Leyser: I just want to flag that what we are talking about here is an extraordinary opportunity in research and innovation for a huge range of people from around the world and from the UK in a huge range of very rewarding careers. We are all sounding a bit gloomy. Our success depends on bringing lots of people in from overseas. That has to be married with nurturing and growing the extraordinary homegrown talent and spreading that opportunity much more widely across our economy and across the UK, because it is the only way we are really going to bring this country back to that high-productivity economy.

Q7 Lord Rees of Ludlow: I would like to ask about the updates on Horizon Europe. I just saw that there was a letter from the outgoing Minister extending the back-up support but I would really like to ask for your general perspective on the so-called Plan B and what the next steps should be.

Professor Dame Ottoline Leyser: It is an extraordinarily important programme. There is incredibly widespread consensus that association for the UK, as negotiated at the time of EU exit, would be the best option. At the same time, given that this seems to have been delayed by the linkage of association with other elements of the agreement, at some point there will be a tipping point where we will need to put alternatives in place. We have been working very hard at UKRI to support this period of uncertainty. We will then focus on a period of transition and then the longer-term Plan B to try to ensure that our communities are best supported.

The underwrite extension has just been made.

There has been a surprising amount of interest in the wider press about the consequences of, for example, our loss of access to the European Research Council and very prestigious fellowships. We have to be really clear about this: nobody who has won an ERC award will lose money. The ERC has said that it cannot hold the ERC award but the Government underwrite guarantee fully supports the funding that that person would have received. The transition role for those underwrite arrangements are really important if we move into the transition to Plan B.

Plan B includes third-country participation, so we will continue to be able to participate in all the collaborative grant activities although we will not be able to lead, which is a drawback but not a loss of access. A huge amount of work is ongoing to put in place alternatives to things like the European Research Council awards and the Marie Skłodowska-Curie Actions and a suite of measures across the transition to bridge.

It would be a huge loss but, if we can maintain the investment that is being set aside to support that loss, which is clear in this spending review and the next, and if we can get that clear commitment, we will be able to put in place a lot of the things that we have been talking about now: those clear, long-term signals and high-quality attractive fellowships. We will hopefully then be able to navigate the shock of that failure to associate.

Professor Maggie Dallman: The uncertainty is a real issue at the moment. If it goes on for much longer, people will begin to lose faith. The underwrite is obviously very positive but there is uncertainty about the longevity of that and how it will play out with some of these other schemes, which are massive in terms of prestige, such as the ERC fellowships and the Marie Skłodowska-Curie Actions that Ottoline just mentioned.

One of the more intangible things is this loss of influence with what research should actually be funded. In the long term, as long as we can get the funding sorted out, the loss of influence of UK-based scientists is going to be the biggest tragedy.

Harry Anderson: I would really emphasise the point that the first preference for universities is still to participate in Horizon. It is a win-win-win, almost. It is a win for the UK, a win for the EU and a win for science generally.

In terms of Plan B specifically, we see it as a really important first step in helping to provide the certainty that we have just been hearing about in terms of what happens if association proves impossible. We would probably want to see quite quickly more information on the budget and the timeline for what implementing Plan B would mean. That does not need to wait for a decision on Plan B, so anything that the Government could do to provide more certainty would be welcome for our universities.

Lord Rees of Ludlow: I just want to follow up on the question of losing the possibility to lead the group. That is obviously a downside, but will it be worse than that in the sense that our European colleagues will not want to involve the UK because of the hassle of visas, the difficulty of travel and all of that? Will it inhibit their willingness to have us as partners?

Professor Maggie Dallman: Anecdotally, we have heard that this is the case already, with people being completely excluded from some programmes and losing their attractiveness to be included in the grants. That is a real concern.

Professor Dame Ottoline Leyser: Some of that is down to this uncertainty. If we do enter a new era on a front foot, many countries around the world participate on a third-country basis and have those challenges that you highlight. It is not that they are insurmountable but we all want to associate. That is critical. If we cannot associate, we need to be clear and maintain that real momentum in investment and collaborative opportunity to allow us to navigate that as best as possible.

Harry Anderson: If we end up not associating for the reasons we have just heard, it makes some of those challenges we have identified even more important for the Government to be engaging with, in order to ensure that the UK is still seen as an attractive destination. If you are looking at the impact of third-country participation, we have heard from our members and universities that the experience of Switzerland is not a positive one in terms of its overall involvement in bids. If we are a third country, we would expect overall UK involvement to drop.

Q8 **Viscount Hanworth:** We have primarily been talking about the means of attracting persons from abroad with the necessary skills in science, technology and mathematics, but nevertheless the question arises as to whether there is a deficit in the indigenous supply of such skills. Are we training sufficient numbers of people with these skills? There are two levels we can look at. The first is the school level—the transition from A-levels to undergraduate STEM degrees. The second, of course, is the postgraduate level.

Professor Maggie Dallman: This is something that is very close to my heart. There is certainly unmet demand from employers for STEM skills, with 40% of employers reporting a shortage of STEM graduates being a key issue. You have to go back to before the transition to university. We have to get our education system properly aligned around delivering high-quality STEM subjects right from day one. We cannot wait until we are looking at that transition, so the whole STEM education system

needs, I think, to be reinforced. It is really difficult to find STEM specialist teachers to deliver a great education in our schools and then the transition to university can be very challenging for STEM students.

In terms of our own pipeline, we are only going to be assured of maintaining that if we make sure that our entire national curriculum delivers an outstanding STEM experience with all the things that I know some members of this committee are particularly concerned about in terms of practical and technical skills development and delivery. Unless we get that right, we do not have a pipeline to feed into higher levels of education, so the entire pipeline needs to be assessed and addressed.

Viscount Hanworth: My next point is on the question of postgraduate training. If I can give my own grim testimony, I have very rarely educated a native British student at postgraduate level; this is in a mathematical subject. Perhaps Harry Anderson has a comment to make on that, because you can see that from the point of view of the statistics that pass your way.

Harry Anderson: If you look at the HESA data in terms of the students studying STEM disciplines, the majority of whom are still UK nationals—there is not a majority in terms of non-UK—the highest proportion is in engineering and technology, where roughly 34% are from outside the UK. We should not lose sight of the fact that the vast majority of the students we are educating on courses are from the UK.

The point I want to emphasise, which we have briefly touched on, is that universities need to be sustainably funded. One of the ways that they look to ensure that they can still teach these courses, which tend to be higher-cost subjects when compared to humanities degrees, is by reinvesting the income that they get from international fees. It is not a quid pro quo or a “one in, one out” situation. It is vital that we have international students studying alongside UK students, not just for the cultural and social benefits but for the economic benefits that they provide to universities.

Viscount Hanworth: Many of our postgraduate courses would have to close in the absence of overseas students.

Professor Dame Ottoline Leyser: This is a critical issue. I would argue that part of our problem in the UK is that we have segregated STEM as some special, difficult thing over there that is really hard to access. In our education system, we critically need to look at the work of the Royal Society in advocating for a broad, balanced, connected curriculum right through to 18 to keep those doors open to students right across their educational experience and right through life, including the ability to retrain.

A really important element, for example, is coding. Coding is currently considered a difficult STEM thing. Everybody in our economy will need to be able to code. It needs to be a primary school subject, along with reading, writing and arithmetic. The notion of these segregated, difficult things is part of what undermines our ability to build empowered, skilled

people to seize the extraordinary opportunities that there are in a knowledge-led and innovation-led economy.

Viscount Hanworth: My own observation is that we have lost the impetus in trying to reform the mathematics syllabus. There were plenty of projects in the 1960s but those seem to have gone into abeyance. Looking at the available texts, I have been horrified.

Q9 **Baroness Sheehan:** Professor Dallman, you used the phrase that we need to start from day one if we are going to develop a meaningful pipeline. I just wonder whether you can say a few words about whether we have enough incentives for STEM graduates to enter teacher training courses and whether they are remunerated well enough.

Professor Maggie Dallman: There is an issue around remuneration but there is also a real issue around respect from the country for our amazing teachers. There is a particular difficulty with attracting STEM specialist teachers, primarily probably because they can get much higher salaries if they enter into private sector organisations than they can in the teaching profession.

There have been some great initiatives, not least of which is the maths specialist schools that are developing. Imperial College is a partner on one of them. This sort of school provides an environment that is very attractive for good teachers. For a start, it is engaged with a university, so there is lots of interchange between the school and university. Teaching staff can participate in extra activities that are of interest and they feel valuable. We do not invest enough funding but somehow we in the UK have also lost that respect and valuing of teaching staff. We need to try to retrieve that.

Baroness Sheehan: Would any of the other panellists like to add anything about the teacher training pipeline?

Harry Anderson: I do not have a huge amount to add. A lot of our universities partner with schools to try to address that pipeline issue, but I echo a lot of what has already been said.

Professor Dame Ottoline Leyser: To re-emphasise this point, to get this right, we need the whole system to work together. We have to value the extraordinary contributions that people across that whole system make. We have talked a lot about attracting the brightest and the best from around the world. That is actually the tip of the iceberg. We have to have that really high-quality, fantastically supported and valued rest of the iceberg in order to make this work. A focus on that small part can sometimes undermine the value and credit that we give to everybody who is needed to make this function.

The Chair: On that point, I am afraid that we will have to finish this session. I am sure that we would have loved to have gone on for quite a lot longer. You have been very interesting witnesses. Thank you very much for coming today.