

Scottish Affairs Committee

Oral evidence: [Science and Scotland, HC 1448](#)

Monday 23 October 2023

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Members present: Pete Wishart (Chair); Alan Brown; Wendy Chamberlain; Sally-Ann Hart; Christine Jardine; Mark Menzies; Ms Anum Qaisar; Douglas Ross.

Questions 1-66

Witnesses

I: Professor Christina Boswell, representing Universities Scotland, Professor Julie Fitzpatrick OBE FRSE, representing the Royal Society of Edinburgh, Professor Maggie Gill, Chair, Scottish Science Advisory Council and Dr Mette High, representing Alliances for Research Challenges.

Examination of witnesses

Witnesses: Professor Maggie Gill, Professor Christina Boswell, Professor Julie Fitzpatrick OBE FRSE and Dr Mette High.

Q1 Chair: Welcome to the Scottish Affairs Committee and our first evidence session on science and Scotland. We have a quad of professors to help us—all female professors, too. I think it is the first time that we have had that in the Scottish Affairs Committee. You are more than welcome. We will allow you to introduce yourselves, and if you have anything by way of a short introductory statement to tell us a little bit about what you do and what your institution is, that will help us with our record. We will start with you, Professor Boswell.

Professor Boswell: I am Professor Christina Boswell. I am vice-principal for research and enterprise at the University of Edinburgh, but I am here today in the capacity of representing Universities Scotland.

Professor Fitzpatrick: I am Julie Fitzpatrick. Today I am representing the Royal Society of Edinburgh, our national academy.

Professor Gill: I am Maggie Gill. I am representing the Scottish Science Advisory Council, which is an independent body that gives advice to the Scottish Government.

Dr High: My name is Mette High. I am a social anthropologist at the University of St Andrews. I am here today representing Alliances for Research Challenges, which is a new initiative funded by the Scottish Funding Council.

Q2 Chair: Thank you all for such concise introductory statements. This is all new to us, so you will forgive us if we are not quite up to speed and you get asked some daft questions. If they seem particularly daft, please tell us; we will then know in the future to get it right next time. This is an introductory session, so we are really interested in the generalities of quite a number of the issues we are looking at. Hopefully, as the course of the inquiry continues, we will be looking at them in a little more in depth.

I will start with one of the most basic things that we can ask when it comes to science in Scotland. We are unique, historically and reputationally, as a centre for science, because of the Enlightenment and all the fantastic inventions that we have seen throughout the centuries. Is that reputation still deserved? We will start with you, Professor Boswell.

Professor Boswell: Absolutely it is deserved. Science in Scotland—and research in Scotland—is an absolute powerhouse for Scotland. It punches well above its weight. It is a real asset and a driver of innovation and economic growth. While Scotland comprises 8.2% of the UK population, it comprises 11.4% of its researchers, measured by the returns of the last research excellence framework. Proportionately, that is a very high number of researchers, and they are producing outstanding research.

Again, based on the last REF of 2021, 85% of the research submitted was judged to be world-leading or internationally excellent. That, not least, leverages a huge return on investment. For every £1 invested by Scottish Government, we see a return of £8 of benefits to the UK economy. It is a huge asset to Scotland and we are rightly very proud of it.

- Q3 **Chair:** I am grateful to you because that will be the first part of our evidence sessions, when it comes to securing evidence for this particular inquiry. Thank you for that. I will go across to Dr High. In your view, are we still worthy of the reputation that we have acquired over the decades and centuries?

Dr High: Definitely. I work in the space of energy, climate change and net zero. One of the things we do extremely well in Scotland is collaborate—researchers collaborating with industry, business, government and local communities. So many initiatives are happening, and that is really driving forward the agenda on net zero. I am very pleased with what I am seeing.

- Q4 **Chair:** I will not ask the other two professors, because I think that you will pretty much agree with most of what you have heard from your colleagues. I will ask you instead—you can take some time to think about this—if it is up to date. Have we maintained this excellence? Have we still managed to be worthy of our reputation throughout these decades? I will ask if you can give us an example of Scottish scientific excellence in the last five years that particularly stands out for you. Can you give us an example of something along those lines, Professor Fitzpatrick?

Professor Fitzpatrick: I certainly think that we have maintained our excellence in science, and many of our impacts have had international impact and are highly relevant. Christina already mentioned the research excellence framework. There were many case studies there—about 750 case studies in total—that gave examples of some of the amazing science that we are undertaking in Scotland.

We have some excellent examples across renewable energy, drug discovery, life sciences, health sciences, agritech and food production in Scotland. Many of those were represented both in the research outputs in REF and in the impact case studies that were defined by that. Many of the universities also collaborated with our institutes across Scotland, again contributing to the international impact of the work that we conduct. So although there is an impact locally in Scotland, there is international impact as well.

- Q5 **Chair:** Finally on this question, Professor Gill, is the reputation for excellence still deserved, and can you perhaps give an example from the last five years?

Professor Gill: Yes. We put two examples in our submission. The first one is on health data. Scotland has excellence in that area and access too, although that was not straightforward during covid. It led to a world-leading paper in terms of the analysis of people with covid. The second example that we gave was in physics. My colleagues and I come from

different areas, and I think Scotland has a lot of expertise across a wide range of sciences.

But something else to take into account is that science is changing, and has changed over the years, in terms of being much more about teamwork than individual scientists. We still have Nobel laureates in science, but they tend to recognise that there are teams that are working in it. I think that a key thing for Scotland is to still be able to have access to work with the best elsewhere. Our second example was a previous CSA in Scotland, who had collaborated in the area—this is outside my area of expertise—of laser interferometer gravitational wave observations, if anyone knows what those are.

The point is not the detail of that so much as the fact that some of these things will be transformational, like we have seen a lot in the press about artificial intelligence. Some of these have risks with them as well as opportunities. Often as scientists we are keen and enthusiastic in our areas, and I think in terms of the broader collaboration—we have heard about it being more interdisciplinary as well, so bringing physics, social science and things together—Scotland is good. We like to think that we are networkers, and we like collaborating. Looking forward, which as scientists we do—

- Q6 **Chair:** A few words have already started to emerge, and I am sure my colleagues have heard them: “teamwork” and—the main one—“collaboration”, which seems to be coming out loud and clear when thinking about the nature of the environment that we find ourselves in when looking at science in Scotland. What opportunities are available for scientists in Scotland to develop their work and ensure that their work has the most world impact? Is it this collaboration that you are talking about? I will come to you, Professor Boswell, with that one.

Professor Boswell: There are absolutely opportunities, and we are seizing those opportunities across a number of areas, whether through collaboration, industry engagement or other areas of innovation. A number of universities in Scotland have ramped up their industry engagement and commercialisation activities, for example, and that has been hugely beneficial.

Let’s grasp the nettle here. There is a considerable funding challenge: only about 83% of our research is actually funded through the dual funding system, which is the core grant and grant funding. That means that we have to cross-subsidise research through other means, mainly through international student income. As you know, that challenge is particularly pronounced in Scotland because of the differential in the income that we get from students, and there are a number of other impediments and ways in which it is perhaps not on a level playing field with England. So there are absolutely fantastic opportunities, but also some real challenges over funding, which I hope we can unpack a bit in this session.

- Q7 **Chair:** We are most definitely going to do that, but I will stick just now to some of the background. Dr High, what do Scottish scientists need to



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ensure that their work is taken to this new world audience?

Dr High: One of the things that we are encountering is a challenge where a lot of funding opportunities come with a very short, compressed time horizon. There will be calls coming from UKRI, for example—so that is UK-wide funding—and we will have a call, build our teams and put in applications, and we are then being asked to deliver very soon after being told that we have won the awards, if we are lucky enough to do so. That very compressed time horizon affects our ability to deliver. For scientists, if it was possible to have a slightly longer time horizon, we would be able to deliver so much more on the pound.

Q8 **Chair:** The funding issue has come up a couple of times, so I will address this directly, because we asked for evidence and we have loads of it; we are grateful to everybody who has submitted what has been really helpful stuff to this inquiry. Funding, of course, is one of the key things that we have dealt with. I do not know about other colleagues on the Committee, but I have looked at some of the funding arrangements—the infrastructure for support and resourcing—and it is Byzantine. It is really difficult to understand who gets what, how that's done and what works with what. You have already mentioned some of the devolution aspects of all this, and comparisons with the rest of the UK.

Just give me your views about the funding infrastructure environment that you work in—don't go too in-depth, because we will come to that specifically, but, generally, what do you feel about where you are? Professor Boswell, you brought it up first, so perhaps you can help us with that?

Professor Boswell: One of the issues is the disparities. I mentioned the cross-subsidisation challenge, but there is also the challenge that there are a number of pockets of funding that we simply do not have access to in Scotland. One of those is much more substantial innovation funding in England, as compared to Scotland. Just to use the example that I am most familiar with, Edinburgh University would be receiving £5 million a year for innovation if it was based in England, whereas it receives £1.7 million, being based in Scotland.

There is a similar disparity around some of the funding for biomedical research, where the NIHR in England funds biomedical research centres quite generously. That is not available in Scotland. Again, a university on the scale of Edinburgh or Glasgow is probably missing around £25 million a year.

Those are huge disparities, and the problem is that that does not just affect our core research funding; it also affects our ability to leverage external funding. In the absence of core funding, we are less competitive for UKRI grants, and we have less capacity to build the infrastructure to support commercialisation and industry engagement. We may well also—this is the risk coming up on the horizon—be less competitive in the next research excellence framework because we have not received the same kind of funding for research culture and the same level of core grant.

There is a real risk of a downward spiral, and a real threat to this position, this status, and, again, this powerhouse of higher education research in Scotland. We might be at risk of having that eroded.

Q9 **Chair:** Is that the experience of your colleagues—Professor Gill?

Professor Gill: Perhaps I can come in on the institutes in Scotland, because Scotland also has a history of endowments from various people setting up institutes—particularly in agriculture, which is my background area. Over the years, there has been a move in how those are funded. At one point, they were being funded within Government, and now they have been moved further out from Government, so they do not get the dual funding system that universities get; they only get the 80% funding that UKRI actually gives. They also have trouble in terms of accessing some of the funding for infrastructure.

I think the institutes are a very important part of the Scottish research landscape, so they are even more challenged in terms of some of those funding limits. It is like trying to keep a small business going without access to all the funding sources.

Q10 **Chair:** We want to capture that and hear more about some of the specific and distinct issues, but just now I am interested in the place we find ourselves with the funding infrastructure in general. We have not heard from you, Professor Fitzpatrick. Give us your observations about how you operate. Is your experience roughly the same as Professor Boswell's?

Professor Fitzpatrick: Yes, the Royal Society of Edinburgh would agree very much with that. The sustained real-terms cuts in public funding since about 2014-15 have caused a disproportionate reliance on international students to cross-subsidise operating costs, undergraduate teaching and research activity. That has an impact, particularly with respect to Scotland's competitive disadvantage. When it comes to large consortia grants, many of the sources of funding at the moment are looking at big science and big teams, and where there is a requirement for match funding, that puts Scotland at a disadvantage. Scotland has had a declining share of UKRI funding over the last few years.

Q11 **Chair:** Could you explain a little the difficulties with match funding, just so we understand fully what the problem is?

Professor Fitzpatrick: Often, research calls will offer up grants of x amount, but there is a requirement for the universities either to match that funding or to make up the difference between the value of the grant and the full economic cost of conducting the grant. Very few funding sources give 100% of full economic cost. Charities give very little and sometimes none. Other sources of funding have differing levels of full economic costing. If it is a match funding situation or the universities or institutes have to help to co-invest, that puts us at a disadvantage. It will also happen for other UK universities and organisations; it is not a specific Scottish issue.

Chair: We are going to get into all of this a lot more, but thank you for



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those fascinating initial responses. I am going to hand over to Mark Menzies.

- Q12 **Mark Menzies:** Professor Boswell, let me return to some of the things you were saying a few minutes ago and explore them a bit more. You talked about big sums of money and used the examples of Glasgow and Edinburgh, where there was a research funding shortfall. The UK Government has said that it wants to raise domestic public investment in research and development outside of the greater south-east of England by at least 40% by 2030. What needs to be done to ensure that Scotland gets an adequate share? How do we bridge that gap and get to the target that the UK Government has set?

Professor Boswell: There are a number of things that we really have to do. There is a particular source of UKRI funding where we see a real, pronounced disparity in what is coming to Scotland, and that is Innovate UK. That is a very important and growing source of funding, especially for translational and commercialisation-type activity. Scotland only receives 5.9% of Innovate UK funding, which is really disproportionate given our 11.4% of researchers in the UK.

Universities Scotland has engaged with Innovate UK to make the point that the kinds of mechanisms through which research or innovation is funded are not based on, or do not fit, the business model that we see in Scotland, which is predominantly SME-based. SMEs have limited absorption capacity for R&D and to engage in the types of mechanisms that IUK offers. We think there has to be more focus on what really works for different regions in the UK if we are going to ensure that the 40% target is met.

There are a couple of other things to mention, very briefly. Really good models of that kind of regional investment can be seen in the city deals. We have a number of very successful city deals, where the Scottish Government and the UK Government have worked together really constructively to prioritise strategic investment in particular areas of Scotland. We have also seen the investment zones recently in Glasgow city and the north-east of Scotland. That is another very good model.

Finally, I should mention that the Scottish Government produced a great national innovation strategy a couple of months ago, in which they set out a plan for a Scottish investment fund, which would help leverage investment into spinouts in Scotland—especially deep-tech spinouts, which require a particular type of investment. That would really help to bring R&D investment into Scotland, but as yet we are not quite sure how or whether there will be funding behind that initiative.

- Q13 **Mark Menzies:** You have just reeled off a list of things: city deals and so on. On their own, will they help to bridge the gap to take you up to the UK average? Are these just the vehicles whereby money can go in, or do these structures—the city deals, investment zones and so on—bring money with them as part of the deal, which in turn would get you to the UK average number?



Professor Boswell: They do bring money, but that leverages significantly more investment than is put in by Government. We have to keep remembering that you get a lot of bang for your buck if you invest in research and innovation in our universities.

- Q14 **Mark Menzies:** On a similar theme, Professor Fitzpatrick, in your reply to the Chair's question at the beginning you reeled off a list of sectors where Scotland, from research and development, was doing rather well. If we think again of the question of how we reach the UK Government target of 40% by 2030, is it within those sectors or are there new sectors that we have to try to bring forward?

Professor Fitzpatrick: There are multiple sectors, and that reflects Scotland's amazing scientific excellence, but there are new sectors, such as satellites and space. Again, there are many different types of renewable energy—for example, hydrogen and carbon capture and storage in terms of net zero, and so on. Many sectors are doing incredibly well. One of the possibilities, looking forward, is to try to create sovereign wealth funds. For example, from the offshore wind sector, capital could be generated that then could be reinvested into better businesses.

I completely agree with Christina about the need to attract private investment to make up the type of income that we need. It is a challenge, because we do not have the same large, multinational companies in Scotland as there are south of the border. None the less, much can be done to try to maintain that. We need things to be clearer from the UK Government about the levelling-up funding and how we can make sure that that comes to Scotland wherever relevant. I agree about the city deals and investment zones.

Lots of things are happening, but we definitely need not just to have private investment but, when our research outputs are translated into spinout companies, to have those scaled up. Scotland has a lot of spinout companies and a lot of intellectual property, and quite often it moves out of Scotland. It may be bought over by companies in the UK or the States, for example. Lots of different countries will buy into our technology. They will also attract our scientists to move to other parts of the world. So we need to be better at tech scaling—scaling up technical companies—and there are some initiatives in Scotland that are trying to do exactly that, but it requires private investment as well as public.

- Q15 **Mark Menzies:** Professor Boswell, you mentioned that every pound invested in research will generate £8 for the wider economy, but Professor Fitzpatrick makes the point that we are able to develop things only so far and then they may get bought over or the opportunity moves outwith Scotland, and often overseas. Let's say that we were able to take away the barriers that prevent further development. What do we think that number could look like? Could it be one in eight, one in 10, one in 20? Has any work been done to look at what the true value would be if we were able to get the support for universities and SMEs—



Professor Boswell: I wouldn't want to give a figure on that, but I think we could look at, for example, the innovation powerhouses in the golden triangle—look at what Oxford has done and what Cambridge has done. I think we should think about our ambition in relation to those sorts of successes. For example, Oxford invested in innovation about two decades ago, I think, and it now sees an incredible return and huge levels of investment in its spinouts, so it is a huge success story and we need to emulate that in some of our universities in Scotland.

Q16 **Mark Menzies:** Are there barriers that could be removed by the UK or Scottish Governments to enable the Scottish research and development sector to flourish further?

Professor Gill: Yes, and removing the barriers is very much how this should be looked at. There are some opportunities from being a smaller country, such as shorter lines of communication and people maybe interacting more with policymakers and industry. It is easier to make those communications. As has already been said, the barriers are more about the finance side, having more of a level playing field in terms of getting access, and the lack of headquarters of large companies. But you can understand why they would want to be in the south of England and creating more of a critical mass there. It is hard to see how you could persuade industry to change what it is doing.

Scotland has a very important input into supply chains. This is another point about the world. I mentioned earlier how science is changing and becoming more collaborative. I think all the complexities of life, with having to deal with multiple challenges at the same time, are very much there too. Perhaps it is not just about removing the barriers, but about helping to strengthen some of the opportunities, as my colleagues have said.

Dr High: From my experience, a lot of it is also about how we retain the best talent in Scotland. Higher education is an international sector, and we have researchers who are travelling from one country to the next. At the moment, the UK as a whole, and Scotland in particular, is not the strongest prospect for higher education. That is the reality; that is where we are at. We have great talent leaving our country, and it is really sad to see. Some of it has to do with decreasing wages in real terms over the last 20 years. That is the reality of higher education.

Another issue—it might sound really petty, but it is real—is the very high visa costs. We are asking great international researchers coming to the UK to pay very high fees and to have money in the bank, just in case something happens, and they need to pay extra for the NHS. That is an up-front cost that you are asking a researcher to pay in order to move to the UK. If something could be done to make the UK a more attractive workplace, that would be great. We are working in a space where some of our competitors internationally offer tax incentives to researchers, because they want to attract the very best of the labour force. Here, we do not; instead, we put up fees. It makes it difficult for us to compete.



Professor Fitzpatrick: I would agree with that. There are some figures from research conducted by the International Institute for Management Development's World Competitiveness Centre, which ranked the UK just 29th out of 63 countries as a favourable destination for international professionals. That is its lowest ranking over the past five years, and a drop of seven places since 2021. It is very much about the stagnating salaries and the cost of living, so there is much that we need to do to lift our international reputation. It has obviously been very difficult with covid-19 and the UK's exit from the EU, which has probably had an impact on the perception—certainly by some international scientists—of the UK, and that is something that the Royal Society feels we need to very much focus on to make sure that our world standing is recognised widely.

Professor Boswell: I agree with everything that has been said. I would simply add that this also links to the funding issue that we were discussing earlier. If Scotland begins to be seen as a place where you are not going to have access to state-of-the-art labs, equipment and facilities, and you are not going to be competing for large grants and so on, it becomes less attractive vis-à-vis England as well as other European and international countries. Then of course, as we know, you risk a self-perpetuating brain drain type effect. There is a risk that that could happen.

Q17 **Mark Menzies:** Professor Fitzpatrick, going back to your list of sectors where we are doing well in research, from our initial reading we seem to be doing very well in space—particularly satellites—in Scotland. Why have we done so well in that sector compared with others?

Professor Fitzpatrick: It is interesting. I suppose, like most sectors that expand and do really well, it is based on really good scientists doing really good basic research that then expands out to become strategic research and commercially viable research. Sometimes that research is done within Scotland and sometimes scientists move to Scotland to do that work. In the satellite and space area there is a combination of those who have come into Scotland because we literally have the space, if you will pardon the pun—we have the geographical and spatial awareness and capacity to have launch sites and space initiatives—but we also have the support of the academics themselves.

For those examples, it is very much about trying to make sure that we attract very large amounts of capital infrastructure money to be able to furnish that. It is not just capital in terms of buildings or equipment, some of which is very expensive; we need to make sure that we also draw down the money to pay the salaries for the scientists to conduct that work. All science is quite people hungry. It is an area that requires people to deliver it.

Chair: You will know that we are concurrently doing an inquiry into the space sector in Scotland, so anything you could do to help us with that would be gratefully accepted.

Q18 **Douglas Ross:** Good afternoon to our witnesses. Can I go back to the funding issue? I think it will come up a number of times today. Professor



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Boswell, if you are not getting sufficient funds from Government, your other source of income is students. What is the current situation in terms of income from students for universities in Scotland? How would you describe that?

Professor Boswell: Obviously, our universities are absolutely built around our students. They are hugely important to us. We really welcome having a balance of Scottish-domiciled, rest-of-UK and international students, and we want to get that balance right. At the moment Scottish-domiciled students are funded at £7,000 per student. Fees from English students are £9,250. Even that higher level of English fees does not cover the costs on average of teaching and learning for students on a university degree in a Scottish university. That means that all of our UK students, especially our Scottish-domiciled students, need to be cross-subsidised, and we do that through international student recruitment.

In some ways that is an end in itself. It is beneficial to have diversity and a mix of students coming from different backgrounds and perspectives on our courses, but we want to ensure that we have the right balance and that it benefits everybody on those courses, including our UK and Scottish students. Obviously, there are challenges in the fact that we depend on international students for cross-subsidisation, not just of research but of the costs of teaching.

Q19 **Douglas Ross:** Do you think we have the right balance at the moment? My colleague in Holyrood, Liam Kerr, was speaking this week about the fact that we now have three times as many international students studying in Scotland as we did when the SNP came to power. I believe this year will be the first time ever that income from international students is more for Scottish universities than the grant that they get from the Scottish Government. Is that balanced?

Professor Boswell: Obviously it varies across universities. I don't want to comment on that balance because it is outwith my role here in the Committee today—I am covering research for Universities Scotland—but it is something that we need to look at. We need to think about the funding model and the sustainability of that model for Scotland and for the UK more generally.

Q20 **Douglas Ross:** I do not want to press you too much on it just now if you are not comfortable with that, but maybe it is something Universities Scotland could write back to us about, because it will actually have an impact in terms of what is available for research and other things done by universities if that balance is not correct and something has to be changed. Would it be okay for one of your colleagues, perhaps, to do that?

Professor Boswell: I can certainly pass that on, and I agree with you that it is an important question.

Chair: Perhaps we can make a note of that and get back to you about it.

Q21 **Douglas Ross:** Thank you. Professor Gill, in your evidence to the



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Committee, you said that the UK faces productivity challenges due to low research and development intensity and the need for better alignment of research funding with Government strategies. What can be done, both with the Scottish Government and with the UK Government? Do you feel there is not enough engagement before these strategies are developed and announced, or could more be done once the strategies are announced, but that is potentially not being put into practice? What were you getting at with that evidence?

Professor Gill: What we are getting at is that perhaps there is a lack of understanding of the impact of devolution. In some areas—obviously, in the devolved areas—there is a bit of a conflict. A Bill might be being enacted in England, yet a different approach is being taken in Scotland. Some of the funding mechanisms do not always recognise the difference. There is a feeling among some scientists in some areas that, within the research councils and some of the Departments in the UK Government, there is not recognition of the specific nature of the way some Scottish Bills diverge from the way that things are being undertaken at UK level.

I am sure you have taken evidence already that the Engineering and Physical Sciences Research Council has put in place regional representatives. I met one recently at a meeting that Dr High and I had organised. There is someone based in Ayr who is specifically there to try to ensure that there is that understanding. I am involved with the Biotechnology and Biological Sciences Research Council and, perhaps because there has long been a recognition that farming in Scotland is very different from farming in England, there is a big effort by that research council to reach out and have people on its strategy advisory panels who can represent the Scottish viewpoint. But that is not the case across the board. That was the point we were trying to make.

Q22 **Douglas Ross:** Although, on that latter point, farming is very different in different parts of Scotland, so I suppose it depends where your experts come from as well.

Professor Gill: Absolutely. In Scotland, our diversity is increasingly being recognised. Because our geography is so varied, with islands, highlands and the central belt, there has perhaps been more opportunity to learn what that diversity means for policies.

Q23 **Douglas Ross:** Professor Fitzpatrick, I wonder what the Royal Society's view is of something we discussed last week, when we heard about the attractiveness of space to female candidates. My colleague Mark Menzies has already touched on this. We heard what I thought was quite stark evidence: one of the courses was initially 50:50 male to female, but 10 years on there had been a huge attrition rate. Have you done any research on the attrition rate in science, with people—particularly women—perhaps studying it but then not taking it on as a career? What can we recommend to try to stem the rate of attrition?

Professor Fitzpatrick: It was not an area that was specifically discussed in the response to this consultation, but it is a subject that is discussed extensively at the Royal Society of Edinburgh, because there is a



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recognition that there is still a lack of diversity in STEM subjects. It is not just space; it is science, technology, engineering and maths, and it is an issue. The attrition rate is obviously one aspect of that. Obviously, we need to look constantly at why that might be happening and how we can try to reverse it. Much of that is about attracting women at a later stage, either to start in science or to come back into it, but there is also the lack of aspirations of young people to take up STEM subjects. These are areas that are discussed regularly at the Royal Society of Edinburgh, but not specifically with this call in mind.

Q24 Douglas Ross: This panel is doing a very good job to offset that today, as it is a full female panel.

Dr High, I looked back at a paper you wrote with a Dr Smith, called "The ethical constitution of energy dilemmas". I was very interested to read that you noted that calls to hasten a transition to less carbon-intensive forms of energy all too often cast fossil fuels, and the people whose work brings them into being, as immoral. Obviously, we have a strong oil and gas footprint in the North sea and the north-east of Scotland, which I represent. Across Scotland, 95,000 jobs rely on that, and these are often high-skilled jobs. How does the current political situation—the Scottish Government are against further exploration of fossil fuels—match with what you wrote in this paper?

Dr High: The politicisation of the energy sector, and the people who work in it, is as intense as ever. We see that very much in the decisions made in Westminster in relation to the Scottish commitment to climate targets. We will see the development of Rosebank offshore—a decision that comes from Westminster—at a time when the Scottish Government are maintaining their net zero commitment. It is very political, and it is extremely important that we recognise that the individuals who are working in energy industries are not bad people for needing a job, and needing to put food on the table. We need discussions about the targets, the commitments, the direction, the vision and the ambitions, rather than casting individuals as bad people.

Q25 Douglas Ross: You wrote that back in 2019; have things got worse since then?

Dr High: Yes.

Q26 Douglas Ross: Could you quantify that?

Dr High: No, but I would happily take on the challenge and think more about it.

Q27 Douglas Ross: Is there a danger that the repeated narrative that anything to do with oil and gas is negative will have an impact? Whatever people's views, there are still many decades of work in the North sea in those highly skilled jobs. Is there a risk that the narrative around that—some people say that the work is immoral—will put people off, including young people who could learn skills in that trade, and then transfer to green energy? The actions of some could put people off getting into this industry.



Dr High: I think so. Definitely.

Chair: It is just like being in politics, then.

- Q28 **Christine Jardine:** Professor Boswell touched on science being quite people-hungry, and the balance of students having changed over the past few years; Douglas Ross mentioned that. I have an interest to declare: I used to teach in the university sector, at several universities. I took three or four years out, and was astonished when I came back at the shift in the number of foreign students because of the need to cross-subsidise. It was not a science course. That reminded me of what Dr High said about the need for international students, and how expensive it is for them to come here, get visas, stay and then work. Do any of you on the panel feel that there is a conflict or tension between the increasing dependency in Scottish education on foreign students and the money they can bring into the system, and the expense for them of coming to Scotland? Do we have to find some way of reconciling that?

Dr High: I am at the University of St Andrews, where this discussion has come up more in relation to the footprint of the university. The university has a commitment to become net zero, and its target is five years ahead of the Scottish Government's target. We have talked about scope 3 emissions. International students are travelling across the world to come to Scotland. What do we do about our scope 3 emissions as an institution? International students sit in a very difficult space: we need them for their money and, when it comes to research, for their skills, capacities, networks and everything that they bring, but there are also expenses that come with them, environmentally and financially.

- Q29 **Christine Jardine:** Perhaps I am over-worrying about it, but do any of you think that Scottish universities have become too dependent financially on international students, which then creates further tension relating to the cost and the environmental damage? Do we need to re-examine whether our universities need to find a way of moving away from this—some would say—over-dependence on foreign students?

Professor Boswell: I think there are risks of over-dependence on particular countries as a source of international students. We have to look into that and make sure that we have the right diversification, but I wouldn't want to leave the impression that we do not welcome and value international students. They are an essential part of our very international, outward-looking universities, and they are also a really important pipeline for attracting the very best international scientists. To give one example from the University of Edinburgh, which I am most familiar with, 45% of our early-career researchers are from countries outside the UK, and that is because they are the best people for the job. I really want to reinforce the point that we are international, outward-looking and cosmopolitan, and want to stay that way.

- Q30 **Christine Jardine:** I did not mean to suggest that you were not, but I was saying that problems are being created by the dependence on international students for finance. There are tensions and conflicts being

created for the universities that perhaps need to be examined.

Professor Boswell: I agree. As we said in the discussion with Mr Ross, the sector is examining those dependencies, and particularly the risks to the sustainability of our business model in the HEI sector if we are dependent on particular groups of international students, but I don't want to necessarily comment beyond that.

- Q31 **Christine Jardine:** On a sensitive question, we have talked a lot about the lack of students, including Scottish students, in STEM subjects. Is there not another problem with the need to bring in international students, and the funding relating to them, in that it contributes to a disincentive for Scottish students to study STEM subjects and go to Scottish universities?

Professor Boswell: I do not think it quite works like that, because there is a certain quota of Scottish-domiciled students whom the Scottish Government fund, so there is not a direct competition for places.

Christine Jardine: What I mean is: should we need a quota? Should we re-examine whether conflicts are created by the current dependency that might ultimately be unhealthy and need to be reassessed?

- Q32 **Chair:** I think there is a piece on that, and the cap has been re-examined constantly over the past few years. We will maybe leave that just now; these are important questions, but I am sure that we will come back to a number of them in this inquiry.

I want to ask about spinouts. Professor Boswell and perhaps Professor Fitzpatrick brought this up. I was intrigued to find out that spinouts are such a big feature of the science community and the commercialisation of a lot of your research. I think I noted that Scotland was a leader in spinouts from higher education institutions. A lot of this is predicated on the intellectual property generated by the HIE, and the issue is how that is made into some sort of production—would that be the right term to use?—and brought to market. Could one of you help us on exactly how this works? I think this was in your evidence, Professor Boswell, so I will come to you first. Why have we made such a thing about this in Scottish universities, and what more might we do to get commercialisation of research through use of the IP?

Professor Boswell: I think the reason we—

Chair: Before you do, sorry—I have just seen that we have been joined by Mr Alan Brown, a first-time attender at this Committee; we are delighted to have him here. I have to pause proceedings to ask Alan whether there is anything he needs to declare to the Committee over and above what is included in his entry in the Register of Members' Interests.

Alan Brown: Nothing to declare, and apologies for being late. As you know, I had a travel nightmare today on the west coast.

Chair: Indeed. I have been getting constant updates from Mr Brown all the way down the west coast main line, so thank you for that.

Alan Brown: I was clean shaven when I left this morning.

Chair: Sorry, Professor Boswell, you were just getting into your stride.

Professor Boswell: Indeed. I think the benefits of that kind of activity are huge. If we have brilliant intellectual property coming out of our research, then we want to make sure that its broader benefits are maximised, and that we can take our insights, services and products to market. That is why we support spinouts in our universities. Many of our academics are very enthusiastic and really want to see their research adopted. We have had particular successes in the life sciences and with drug discovery, where we have some fantastic success stories on spinouts. Of course, that does require quite a lot of infrastructure and support in our universities, because the types of knowledge and expertise you need to set up a spinout and attract investment to it are considerable. We need to set up technology transfer offices, we need legal teams, we need people to analyse the market, we need to attract investment, and so on. Some of our larger universities have made immense progress in that direction. For others, doing this is expensive, and we would benefit from a higher funding to support those sorts of activities.

I return to the two points I made earlier: about the need for a Scottish investment fund, which would support investment and bring in capital to support those sorts of spinouts; and about the inequity in the innovation funding that Scotland secures, as opposed to England. If we addressed those, it would really support the set-up of successful spinouts.

Q33 **Chair:** I hear that loud and clear. I am interested in the spinout feature, because it seems to be an important part of operations in Scottish universities and the commercialisation of a lot of research. I see Dr High nodding; could you maybe tell us how important this is for research in Scotland? What part does it play in the general infrastructure?

Dr High: That really resonates with what we on the Alliances for Research Challenges are doing; that is why I was nodding. The Alliances for Research Challenges is about bringing all the universities in Scotland together, across all disciplines; all of us across the arts, humanities, social and natural sciences are working together. It is not just academics working together, but working with industry and business, where we see a lot of spinout activity, and with Government and community organisations. It really is a cross-sector initiative.

Each alliance is centred around a particular challenge. One is on quantum technologies; another is on brain health; a third is on food systems; and ours is on energy and sustainability. We have that very focused attention on that particular societal challenge, which is a key priority for the Scottish Government. Then we also have that really broad stakeholder engagement bringing everyone together. We can already see and hear from those bringing research into commercialisation that this is the environment they need. They need funding, which is so important and so difficult to access, but when it comes to intellectual capacity, we have the right environment.



Chair: We will have to move on. This is a big panel, and you have lots to say, which we are all very much enjoying, but there are quite a number of my colleagues to bring in. I am interested in the monetisation of intellectual property in this sphere; I am on the all-party parliamentary group for intellectual property, so maybe I will explore that a little bit further with you guys at some other point, but we will move on now, and I hand over to Sally-Ann Hart.

Q34 **Sally-Ann Hart:** Thank you, Chair. I think it is fair to say that we are very good at setting up businesses, but not at growing them; we need to get better at that. I will ask about the recently established Advanced Research and Invention Agency. I will start with you, Dr High. Do you think the scientific community in Scotland has had adequate input into the development of ARIA?

Dr High: As we at the Alliances mentioned in our submission, ARIA has a very particular conceptualisation of transformational science. The Alliances is a strategic initiative to bring together multiple stakeholders, and we feel that ARIA is perhaps too narrow. It could benefit from a much broader conceptualisation. How do we address complex challenges? Complex challenges will require complex teams, complex skillsets and complex methodologies. It would be great if ARIA could widen its scope a bit more.

Sally-Ann Hart: Thank you. Professor Gill?

Professor Gill: I attended a webinar, organised by the team from ARIA, which brought together a lot of Scottish academics. There was a general feeling that we were not somehow being kept in the loop with ARIA. It has taken quite a long time to gestate and appoint. Now it has appointed these programme managers, one of whom will be based in Glasgow. It is a nice concept—you get a lot more freedom, and it certainly worked in the American research environment for achieving a particular mission; but, particularly in defence, it needs to keep talking to other academics. It is one part of the spectrum of science that goes from discovery all the way down to what we have been discussing about missions and, as Dr High said, meeting the big research challenges.

I hope that ARIA feels that it is part of a wider landscape of research, that it does not go too far on its own, and that there is engagement with the broader academic sector.

Sally-Ann Hart: Thank you. Professor Fitzpatrick?

Professor Fitzpatrick: The Royal Society definitely welcomes ARIA's mission, and particularly its contribution to a greater diversity of research funders across the UK. We feel that ARIA will broaden the opportunities for researchers and enhance the viability of more speculative research. In other words, scientists know that much research does not deliver exactly what it is anticipated to, so there is a sort of antipathy towards risk. ARIA will be high risk, potentially high reward, and the RSE thinks that will yield considerable benefits for society. It is based on the DARPA model from the United States, from which there were some fantastic outputs.

The RSE has appreciated the engagement that we have had so far with ARIA, but we would like for it to be regular, and perhaps slightly more inclusive—not just including universities as the deliverers of research and development, but institutes and wider academic organisations.

Sally-Ann Hart: Professor Boswell?

Professor Boswell: I agree with what has been said. We very much welcome the potential for more flexible approaches and experimentation with different models, but of course there can be a trade-off between that kind of flexibility and light-touch approach, and making sure you have the right kind of transparency and rigour in your processes. It is all about getting that balance right. There are some risks around inclusivity, especially in relation to regional spread and meeting the 40% target. We need to keep watching that space, be vigilant and ensure that we have that open approach.

Q35 **Sally-Ann Hart:** On the regional spread, the benefits of ARIA funding will not be restricted to a single location; it is for areas across the UK. Is there anything specific that you would like ARIA to do regarding funding, geographically? Where do you think some of that funding could be concentrated? I start with Professor Boswell.

Professor Boswell: As you are intimating, ARIA's mission is not to ensure that levelling-up goals are achieved, but I know that the CEO, Ilan Gur, is very open to these discussions, and very aware that this is a priority for the UK Government, so there is an openness to discussions. You probably cannot fix this in a top-down way by setting quotas for regional allocations, but at the very least, you can make sure that you are inclusive, have good regional representation and engage researchers across the field—in the programmes, and in the wider community of peer reviewers involved in the process.

I think it was mentioned that of the six UK-based programme directors that were recently appointed, one is from Glasgow, and one is from Newcastle, but four are from the golden triangle—I think two are from UCL and two from Cambridge. That is not quite as diverse as we would like to see, but we have made this point to Ilan Gur. As I say, we have to continue being vigilant and ensuring that we have that openness and representation.

Q36 **Sally-Ann Hart:** Thank you. Is there anything you can add, Professor Fitzpatrick?

Professor Fitzpatrick: I do not really have very much to add from the Royal Society's point of view, apart from it being really important that some of our fundamental research—our basic research—is fed into what the opportunities might be through ARIA funding. Some of the science that we undertake has the potential for disruptive technologies, with quantum computing being one of them and artificial intelligence another. As long as we feed some of Scotland's science excellence into the opportunities, we feel that is going to be covered well by the programme managers.

Q37 **Sally-Ann Hart:** Do you have anything in particular to add, Professor Gill?

Professor Gill: I don't think I have anything to add to what has been said, because I do not have a clear view. The programme managers have not long been appointed, and it remained clear in the webinar that, if you look at their disciplinary backgrounds or where they have come from, they would not necessarily be expected to stick to their own areas in terms of the programmes that they develop.

It is good, as others have said, that there is a different funding model. I think we can always learn from a range of funding models to see what works specifically, provided that there is sufficient exchange with the people in Universities Scotland and, as Professor Fitzpatrick has said, with the institutes as well. The institutes have been on the sort of mission side. I think ARIA, while there is a lot of freedom there, is a bit like the alliances. It is about solving challenges, not just doing science for the sake of doing science.

Q38 **Sally-Ann Hart:** I have one last question, and I will start with you, Dr High. In what ways do you expect ARIA to be able to support Scotland's science sector.

Dr High: An issue that was raised within our leadership team was the real hope that ARIA's funding is not going to affect UKRI's funding, since they sit in and are sponsored by the same Department—the Department of Science, Innovation and Technology. As long as that does not happen and we have more flexible funding parts, it seems like a great opportunity, especially if it would broaden its scope.

Q39 **Sally-Ann Hart:** Do any of our professors have anything they would add to that question? Professor Gill?

Professor Gill: One thing I would add is that I hope it gives inspiration to early-career researchers. I think the research councils are increasingly recognising the need to bring on early-career researchers and give them opportunities earlier. I hope that ARIA does consider the opportunities there, and I hope that it provides an alternative for early-career researchers. We all change during our careers—we see where our limits are and we follow different career paths. I hope that it provides an alternative for people whose brains, and whose approaches to science, are very imaginative and innovative. I hope, from that point of view, that it provides that opportunity.

Q40 **Sally-Ann Hart:** I would like to explore that a bit further. A lot of the people who are amazing at research and at inventing stuff might not necessarily be the best people to go on and develop a business. Do you think ARIA is something that can help with that? Or do we need something extra to help the development of an invention into the creation of a market and letting market forces do their bit?

Dr High: As I said earlier, science now is about having teams of people. The challenges are complicated. We need people in science who go into depth in a particular discipline—we cannot do without that—and we need



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people who can work across disciplines and people who can take it into the industry. I think we are still struggling to find how to create and recognise teams, that everyone has a place within that and that the whole is bigger than the sum of the parts. It is not that somebody who is good at scaling up is the one who makes all the money and the one who has the imaginative ideas gets left out.

Professor Fitzpatrick: I would add that if ARIA is successful, there will be a travelator—a translation from the disruptive technologies into the business development models, and into what we hope will be major investment by private companies, because that is what has happened in some of our competitor countries across the world. There is really substantial investment, because private companies will want to invest in some of these disruptive technologies to answer the global challenges—the good of society, the environmental challenges we have. I see ARIA as attempting to pump-prime: to create a travelator all the way through to companies of scale and international impact in a diverse model that is different from—I don't want to call them more traditional, but our other funding opportunities.

Q41 **Wendy Chamberlain:** Thank you all very much for being here today. My first question is on the research excellence framework. The REF is managed via Research England. I see that there is a joint steering group, but I would like to understand how you all input into the REF. Is it via the Scottish Government, or via the Scottish Funding Council? I am open to anyone who wants to fill in the gap for me.

Professor Boswell: Can I ask for a clarification? Do you mean how we input into the structure and framework for the REF, or how we input our own research?

Wendy Chamberlain: In terms of ensuring that the REF properly reflects the value of the work happening in Scotland.

Professor Boswell: There are a number of channels for that. One is that when the FRAP reported, it issued a consultation process. We are feeding in as Universities Scotland, RSE and so on, and individual universities are feeding into it. The scope of that consultation has been relatively limited. As you are probably aware, there have been quite a lot of noises across the sector about its frustration with that. We are now being asked for broader comments around some of the proposals about beefing up the people, culture and environment section in particular—the research culture element. That is one way—through consultation.

Another way is that universities are represented on the Scottish Funding Council's RKEC—the research and knowledge exchange committee. The SFC is part of discussions on this. As universities, we also have panel members who act as assessors in the REF. They are often part of the discussion about what will work and how feasible different ways of implementing the REF are, and so on. So there are a number of challenges.



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Having said that, it would not be amiss to point to some frustration in the sector about the fact that some of the proposals have perhaps not been properly road tested with universities to ensure that they are feasible and implementable and, as with any complex organisation—and universities are quite complex organisations—whether there might be inadvertent or unintended consequences of certain changes within universities and in terms of the reputation across the sector.

- Q42 **Wendy Chamberlain:** That is very helpful. I suppose that demonstrates the number of challenges and the different channels as well. As you said yourself, REF 2021 assessed 85% of research from Scottish universities as world leading, which suggests that that REF was at least giving you the opportunity to put things forward in the shop window. Dr High, I understand from the evidence that the Alliances for Research Challenges talked about the subject-based assessment. Could you share some of the frustrations about where we are with REF 2028?

Dr High: With pleasure. With REF 2021, and now with FRAP, it remains a very traditional approach to higher education. It is organised according to disciplines. They are trying to recognise the interface, which is super exciting and where a lot of exploratory work is happening, through interdisciplinarity, which can be raised in the people, culture and environment section, but when it comes to how we submit our work, it is organised according to disciplines. When it comes to how it is reviewed, it is reviewed according to disciplines. It sets benchmarks according to disciplines. It is a very siloed approach that reflects very well how research was done decades ago. It does not reflect very well how research is done today, especially in Scotland, so it puts Scotland at a disadvantage.

- Q43 **Wendy Chamberlain:** I suppose the question that leads from that is that as research and science has developed not only in Scotland but across the UK and globally, who actually benefits from continuing to assess in such a disciplined-based way? Professor Gill, can I ask you about that?

Professor Gill: I am much less involved with the REF than the others here. My only comment is to back up what Dr High said about the traditional and the history. I was involved before it became the REF, when it was something called the RAE. It really needs to keep moving with the science. There is a lot of discussion among scientists about what the best science is, or what good science is. There are a lot of different ways of defining what “best” is. Is it about academic excellence? Is it about impact? It is a little bit about everything. How do you have one system that covers such a wide range of size of institutions, because we have big universities and smaller ones? How does it cover all the different missions of institutes as well?

Wendy Chamberlain: Absolutely, and it is about having the right emphasis at the right time.

Professor Fitzpatrick: The Royal Society of Edinburgh has submitted its view on the REF. There is a paper that describes that. The Royal Society is



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obviously a national academy and it is a research funder, not a research provider, so the responses from the Royal Society very much look at the cross-sector issues. The general feeling is that the movement in direction is good because it is about more inclusivity and diversity. The Royal Society's mission is "knowledge made useful", so the impact agenda is particularly important to the Royal Society. Scotland is quite a small country but we are quite well connected, and interdisciplinarity is one of our features, so it would be nice to see a REF design that takes into account more of that type of approach. More work needs to be done, particularly on the impact area, in respect of how we try to judge what that means.

- Q44 **Wendy Chamberlain:** It sounds like it is still a work in progress; is that fair to say, or is it more set? The Scottish Funding Council said in its evidence that it has "significant influence", but if we feel there are elements that are not necessarily meeting Scotland's needs, is that accurate? You screwed up your face, Professor Boswell, so I am going to ask you.

Professor Boswell: Inadvertently! I am not sure that this is a particular Scotland issue. It is a UK-wide issue. We have been articulating concerns and universities have raised two main concerns in response. The point about interdisciplinarity is well taken, but it is very difficult to conceive of a viable structure for actually creating interdisciplinary panels. Lots of ideas have been mooted, but it is very difficult to see how you would put that into practice.

The two key issues where there has been concern are, first, around the raised weighting of the PCE dimension—essentially, the research culture dimension—from 15% to 25% in one go. There, the sense from Universities Scotland is that although we welcome the increased importance attached to research culture, which is absolutely fundamental, we feel that a lot of groundwork needs to be done in order for us to operationalise that, let alone measure research culture across our universities.

The second key issue is around the so-called decoupling of researchers from their output—a proposal that, unlike in 2021, not every researcher needs to submit an output. You can imagine that that could have implications for equality, diversity and inclusivity, as universities may not feel that they need to provide equal research support for everybody because not everybody has to be submitted. Those are the key concerns and, to be fair, they are probably shared UK-wide rather than just in Scotland.

- Q45 **Wendy Chamberlain:** Dr High, you said that Scotland had been put at a disadvantage. Based on the evidence that I have heard this afternoon—I might have got this completely wrong—is part of the reason why Scotland might be put at a disadvantage that the outputs of the REF are potentially more critical for Scotland, given the fewer funding pots that there are available? Given the description of the funding available in England, how well Scottish universities and institutions perform in the

REF potentially has a bigger impact on what funding outcomes might be successful.

Dr High: One of my other hats is as director of research at St Andrews, and looking into how much money a university like St Andrews is getting based on its REF performance. I was surprised that it wasn't more. The amount of time, money and energy that goes into the REF is just staggering, and then we are fighting over what is, in the big scheme of things, not as much money as you would have thought.

I would favour a streamlining of the system—a simplification. Maybe we could think about submissions at an institution level—no discipline level and no department level, but an institution level—and maybe we could think about averaging it according to full-time equivalent members of staff so that we can still think about the different skills we have in Scotland and elsewhere. It is just an idea to try to get away from this very discipline-specific focus we are working with.

Q46 **Wendy Chamberlain:** Those do sound like UK-wide issues. Thank you very much.

My second question is about UKRI, on which we did a bit of work in our universities and Scotland inquiry. Indeed, we made a recommendation that somebody from the Scottish Funding Council should sit on the UKRI executive committee, but we were told by the UK Government that the appointments are made on personal experience and skill set, rather than there being specific people with geographical responsibility. To revisit that, I suppose, how effective is the system that UKRI uses to distribute funding? Do we feel that Scotland is getting its fair share? Professor Fitzpatrick, I will come to you on that first.

Professor Fitzpatrick: From the Royal Society of Edinburgh's perspective, there are good links with UKRI. The chief executive and board have visited the Royal Society on a number of occasions recently. They do take their strategy and themselves on roadshows and go round the devolved Administrations—the four nations of the UK—and I think they do that to make sure that there is a high level of engagement.

Obviously, people always want more and the Royal Society would say that it would be good to have even greater interaction with UKRI, particularly on discussing Scottish research priorities—the areas we are particularly good at now or want to become particularly good at. One of the suggestions was to have an office in Scotland where UKRI representatives would be based, which would make the interactions even closer.

Q47 **Wendy Chamberlain:** Okay. Would you agree with that, Professor Boswell?

Professor Boswell: I would agree with that. I would also just point out that we have seen a relative decline in the proportion of UKRI funding coming to Scottish universities, from a bit over 15% to roughly 13%.

Q48 **Wendy Chamberlain:** What do we think the reasons for that are? Going back to my last point, does the fact that there are not other funding pots



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for Scottish universities mean it is more difficult to make bids for UKRI funding?

Professor Boswell: Exactly. I think that is spot on. The type of investment that you need to be competitive for the larger, more complex grants really relies on some core funding, which helps you to leverage your attractiveness in those sorts of bids, so that has a knock-on effect.

- Q49 **Wendy Chamberlain:** That is interesting, because that also came out in our science inquiry session last week. My other question is to Professor Gill. Earlier, you mentioned research councils and the work that some of them are doing. From a UKRI perspective, could different research councils be doing more?

Professor Gill: As I referred to earlier, the different research councils are taking slightly different routes in respect of the things they are changing, like the engineering and physical sciences having—

- Q50 **Wendy Chamberlain:** Could UKRI be giving more direction? Would that be helpful?

Professor Gill: I think they could perhaps learn more internally among the different councils. Those of us who have been involved in mergers of institutions, which to some extent UKRI is, know that it takes quite a long time. Each research council has, understandably, a slightly different culture because they are coming from different bits of science and the communities they are serving with the funding are also different in nature. We are all progressing with this, recognising the need for interdisciplinarity. It could be really good to take the best bits from the different research councils, which perhaps needs a bit more direction—

Wendy Chamberlain: From the centre.

Professor Gill: I think the chief executive is doing a good job. It is a large organisation with a very large budget, so what can we reasonably expect to achieve in the time that it has been operational? I would prefer to describe it as being that each research council probably has a good bit of how they are changing; if we could merge all those and have all the research councils using those good bits, that might be a way forward.

- Q51 **Wendy Chamberlain:** You would think that surely that would be in UKRI's interests, because that would then mean that the budget it has would be spent most appropriately, whichever sector a discipline is in.

Professor Gill: I think there are good signs of progress.

Chair: I am conscious that I want to finish the session by 5 pm to relieve you all and get you back to Scotland. We have three Members who are still to participate—Christine Jardine, Anum Qaisar and Alan Brown—and we have half an hour, so would 10 minutes each be sufficient?

- Q52 **Christine Jardine:** Thank you all for coming today. I want to move away from universities to independent research organisations. One of the points that was made to us in an independent review was that applying



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for grants and specific research funding is designed with universities in mind, which potentially puts independent research organisations at a disadvantage. People like Cancer Research have said that the value of institutes that sit separately from universities cannot be overestimated. Do you think there are any funding gaps that affect independent research organisations? You touched on this in your introduction earlier. What support could the UK Government offer to help independent research organisations to overcome that specific barrier?

Professor Boswell: I am a representative of Universities Scotland, so it is for somebody else to answer.

Professor Fitzpatrick: The institutes, or the independent research organisations, are clearly an important part of the Scottish ecosystem, and their equivalents across the UK are an important part of the UK ecosystem. They are not judged by the REF, which is one of the major differences. That is understandable, because they have a different funding source, but it probably results in a slight underestimation of the impact of the institutes. We mentioned before that they often appear in the case studies from universities, and that is through collaboration.

I think institutes and universities in Scotland collaborate particularly well. There is probably a relative underestimate of the impact of the institute sector, and I think that is the case both within Scotland and at the UK level. There is an increased focus on that because it is increasingly recognised as being important to the whole future of science in Scotland and beyond. That is all I would say.

Q53 **Christine Jardine:** Professor Gill, would you like to add anything?

Professor Gill: Yes, I would like to make this point. You are quite right: the funding, like UKRI funding, is assuming that there is the dual funding model. But if you go back in time, the institutes were set up by independent philanthropists in different ways. Therefore I don't think you can look at all the institutes as necessarily being the same. Some have more potential income opportunities than others, just because of the way they are. You can compare something to do with the environment with something in an area where there is more likely to be industry investment.

I think a key thing would be for UKRI to fully recognise the differences in the different organisations. One organisation, SAMS—the Scottish Association for Marine Science, which is key to the aquaculture industry, which is important—is a different model from other institutes in Scotland. So I think recognising that diversity would be step 1. UKRI recognising the consequences of that diversity in funding models—this is not just in terms of the topics that they cover—would be a good starting point.

I would also say that there is a diversity beyond just the institutes. We have heard about the Alliances from Dr High. There are also other models, like innovation centres, which were initially funded by the Scottish Funding Council. There are also leadership groups. There are a lot of small organisations, each of which has a specific niche in terms of delivery, and some of which are really appreciated by—I have heard people from UKRI



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saying, “We wish we had something like this.” We also have centres of expertise, which are at the interface between science and policy and which are funded by the Scottish Government. But I think they are all small amounts of funding. As we discussed earlier, they are trying to leverage additional funding, whereas Professor Boswell mentioned the biomedical centres, which have much more substantial, longer term funding.

In my career, I have been through multiple different versions of institutes. But we have no time: we have six years before 2030 and we need to do something serious about climate change. I don’t think we have time to look at changing models; that is not what I am arguing for here. I am arguing for trying to support the ones that are in critical parts of, as Professor Fitzpatrick called it, the ecosystem of research. Perhaps the first point is to map out which are the critical ones, and then there is a need to make sure that they are supported, even if that means a bit more variety in funding models.

- Q54 **Christine Jardine:** So we should be focusing slightly differently, on where the funding needs to be; we should be looking at these critical areas, rather than remodelling and redrawing the structure?

Professor Gill: Yes. I think just making sure that the functions—I have gone off institutional structures as a way of delivery. I would say: what are the functions that are needed? And then there are enough people in all these institutions to tell you the best way of achieving that.

- Q55 **Christine Jardine:** Does anyone else want to add anything to that? No. We have talked a lot about comparisons between Scotland and England; they have been a key theme throughout the evidence. As part of devolution, Scotland is able to decide how it will spend any Barnett consequential; the Scottish Government do not have to follow what the UK Government say. But what effect do you think the differences between the levels of funding for research and development in Scotland and England—we have touched on this already—are having on the scientific community? Professor Boswell and Professor Fitzpatrick, which one of you wants to start?

Professor Boswell: I can kick off by reiterating some of the earlier points about the fact that, obviously, having a lower level of core funding has a knock-on effect in a number of ways—in terms of what we can leverage from UKRI funding, how we can support commercialisation activity and how well we do in, for example, the research excellence framework. There are a number of knock-on effects. We also mentioned the risk of not being able to attract top talent internationally. That is another of the knock-on effects. So there are real risks here.

I do not really want to get drawn into the complexities of Barnett consequential—therein lies the path to madness—but the sector would appreciate stability, knowing what funding is coming down the road, having multi-year settlements for funding and having funding at a level that matches what we see south of the border, because otherwise we really will see a relative decline in Scottish research.

Professor Fitzpatrick: I echo that. Budgets are tight everywhere. Flat cash in Scotland is certainly challenging, and it has put pressure on certain elements of research providers.

We mentioned earlier about the deficit of devolution capability across the UK, and perhaps having a better perspective on issues that are devolved to Scotland versus reserved powers, just so that we have an opportunity to talk about priorities and specific Scottish systems that need to be taken into account.

Professor Gill: The issue of talent is key, as is the cost. Advances in technology have occurred, and a lot of the equipment that is required for delivery of those is really expensive. Sharing that between different organisations is key to attract the top talent.

Q56 **Christine Jardine:** Does that take us back to your point, Dr High, about the cost of coming here? Attracting talent is vital, but do we also have to look at the cost of coming to this country, being a researcher here, getting a visa and being able to stay?

Dr High: I think so. It is crucial. At the end of the day, we are a sector of people, and if we do not have the people, we do not have the sector.

Q57 **Ms Qaisar:** Thank you for joining us today, panel. For the science sector in Scotland to flourish, it needs to attract the best scientists and researchers to study and work in Scotland: that is something you have all alluded to. What more can be done to ensure that Scotland's science sector is more attractive for students, researchers and academics?

Dr High: What more can be done, apart from in the dream world in which money is endless and we do not have to worry about those issues? Something else that could be done is to really recognise the diversity that we have in Scotland when it comes to research-active institutions and the business landscape.

We got on the topic earlier about how Scotland is very good at creating spinouts and SMEs, but once they get over a certain size they move away. We do not have a lot of large industries in Scotland in the private sector. We talked earlier about some of these grant calls—it puts us at a disadvantage because we do not have the capacity to be competitive for the very large grants, and they often end up in that golden triangle. If there was more diversity, both in the kind of funding that is being provided and in the funding models—it could be very exciting to see large grants with multiple principal investigators, where we could co-host big grants. At the moment, it is a landscape of competition, but in Scotland we very much work as collaborators. There is a tension between collaboration and competition, and if that could be better aligned we would be better off.

Professor Boswell: We mentioned some of the obvious, very tangible barriers such as fees. For example, if you are a researcher coming in on a global talent visa with a spouse and two children, you will pay more than £20,000 up front for five years of visa and health surcharge and so on.



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That is incredibly expensive. I could actually quote the Minister for Science, Research and Innovation, who recently said, "The UK will not become a global superpower behind a visa wall." It is acknowledged in the UK Government that there is a real tension, and we were discussing that earlier. That is a tangible thing that we could really change.

International funding is crucial here. I will inject a note of positivity into this otherwise gloomy discussion and say that of course we were absolutely delighted about the decision to associate to Horizon Europe. That has been hugely important for Scottish universities in really nurturing those sorts of international collaborations and attracting top talent, for example, through the European Research Council schemes, which are really the gold standard in transformative research and have a reputation across the world for being attractive funding. I think that is all very good. It is important as well to continue to convey positive, welcoming messages; there is that symbolic aspect of this. The Scottish Government have been good at, for example, conveying the message to EU nationals that they are welcome to come to and stay in Scotland.

On the funding side, one thing I would say is that Scotland benefited enormously from the global challenge research funding—the ODA-related funding—which was injected into the system over a period of about five years and then halted quite rapidly. That was really quite devastating for a number of research projects, for our international ties and so on. I know that a review is currently underway about ODA-related funding, but is there anything that you can do to try to use your influence to encourage a revival of that kind of funding? The replacements that we see at the moment simply do not quite meet the ambitions of that previous funding, which really nurtured that kind of cross-national collaboration.

Q58 Ms Qaisar: The James Hutton Institute knows the challenges around the cost of visas and fees for international staff. We have spoken about that at great length. Cancer Research UK states that there is a high administrative burden with the UK immigration system. Quite simply, does the immigration system that is reserved to the UK Government work for or against attracting the best researchers to Scotland?

Professor Fitzpatrick: This is not a question that we directly considered for the Royal Society of Edinburgh; I think that we have already described most of the challenges. I definitely agree that the immigration status must ensure that we can attract the best scientists from across the world, and that means stable funding. It means funding for visas, which obviously can sometimes be covered by the universities or the institutes themselves, and opportunities to gain international funding. That is why access to Horizon Europe and, hopefully, further opportunities through the ODA moneys or the equivalent are really important. The immigration system is very important, and there have been positive moves in benefiting people coming to Scotland recently on the visa system.

Q59 Ms Qaisar: Would anybody else like to add anything to that before I hand back?



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Professor Gill: Yes. I will just pick up on the GCRF and bring in something that perhaps we have not talked about a lot: the timelines of funding and the fact that where we are dealing with some of these long-term challenges, such as climate change, we are trying to look at adaptation. Government funding with the spending review cycle etc makes it exceedingly difficult to fund and to give that continuity. I think something that you have heard come across is the need for a bit more certainty.

I have a bit of a background in international development, and I was involved in the early days of the Global Challenge Research Fund. One of the things about it is that fluctuation. There is this certainty and looking ahead. We know that—sorry to repeat this; I say it at every meeting I go to, and it is science!—we have only six years and a couple of months left until 2030 to meet some of the things said internationally that we must do. The less disruption there is to the scientists who are beaver away—and, as we have heard, have excellent skills in relation to this—the better, and the more long-term with all the issues of Government financing. Innovative ways of finding how we can give so much of that more certainty and allow some of that longer-term research to be funded with continuity would be really welcome.

The UK as a whole, but Scotland too, has had long-term firms that have been owned, for example, by these institutions, such as the James Hutton Institute. We know the management way back, over decades. Are we making enough use of some of that information? When we were looking at how the James Hutton would change—it was previously funded by the Scottish Government—one of the issues was about having a particular pot of funding that was to maintain national capability, such as the soil survey of Scotland. I know that you do not want us to go into detail, but that is basically to say about this long-term looking into how we could come up with something innovative about the long-term funding that we need if we are going to understand the peat bogs, their diversity and what is happening with them.

Q60 **Chair:** Being the MP whose constituency has the Hutton Institute within it, I have heard lots and lots from Colin Campbell on that soil survey, so thank you for that. Lastly, I call Alan Brown.

Q61 **Alan Brown:** Thanks, Chair. Just continuing that international outlook, and just to discuss Horizon, I will first of all look at the impact, post Brexit, that leaving Horizon had before the recent agreement was reached. Universities Scotland has said, among other things, that “The delay to associating to Horizon Europe has had a significant negative impact in terms of funding, applications, and attraction and retention of research talent.” Professor Boswell, could you elaborate on the potential missed funding opportunities and what it has actually meant in terms of attracting talent, and possibly losing talent, over that period?

Professor Boswell: It had a particularly significant negative impact on what we call pillar 2, which is the collaborative part of the programme. Obviously, the UK could not lead on collaborative grants, and any money

that it did receive as a partner was underwritten by UK Government, so it was not directly receiving EU funding. I think that there was a lot of misperception and anxiety among European partners about having a UK partner onboard. There was also some confusion among researchers about what they could and could not apply for, and whether a UK partner would be seen as beneficial. Laid over that is the impact of covid and restrictions on travel between 2020 and 2022.

Therefore, the concern is that we have arguably seen a lost generation of early and mid-career researchers, who had confusing and limited access to Horizon Europe collaborative funding and who also were restricted in their ability to travel and to foster those sorts of European partnerships. That creates a real risk and loss to the richness of our international research, which we are hastily scrambling to rectify. Universities Scotland is actually in the process of consulting with universities across Scotland to explore what mechanisms they are putting in place to try to revitalise and reactivate those sorts of collaborations and to think about how Universities Scotland can support that.

I would say that, by contrast, the activity on what we call the mono-beneficiary schemes, so the individual fellowship-type schemes, actually held up surprisingly well. I think we have not seen such a hit there. There were concerns about people moving away from the UK because they could not access that funding, but it is really pillar 2 that is the challenge.

Q62 Alan Brown: You said “lost generation” there, which is quite a damning comment. What needs to be done, and what support is needed, to actually reinvigorate, get that support, enhance the talent and increase the talent pool against that backdrop of what we spoke about earlier—visa barriers, cost barriers and ending the freedom of movement? What support is needed to get the best out of associate membership of Horizon?

Professor Boswell: We know what the levers are, and it is about encouraging and enabling our researchers to access information. Often these funding schemes are quite complex, so they need expert advice in accessing and developing bids, finding partners, travelling, organising events and meetings and so on. That all requires some money.

Obviously, DSIT at the moment is thinking about whether there is any underspend or unallocated money that was not spent on Horizon Europe that could be allocated across the university sector. If we do see that kind of grant being given out, we would obviously see Barnett consequential. That is where I would say we would be absolutely delighted and hopeful that we would see that then trickle through to universities in Scotland, so that we can help revitalise those crucial collaborations.

Q63 Alan Brown: I hear your plea about direct funding, but Universities Scotland highlighted in its submission that, “Over the last multi-year Horizon programme, Scotland brought in close to €900 million, boosting our innovation economy.” Can you put a figure on how much money has potentially been lost during the period when we were excluded from



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Horizon?

Professor Boswell: I am not aware that we have an analysis specifically on that, but I will check and ask to see if we can provide some kind of estimate.

Q64 **Alan Brown:** Okay. Can I turn to Dr High? Alliances for Research Challenges stated that Scotland has been disproportionately impacted by delays in the Horizon Europe negotiations and Brexit. Can you elaborate on your experience in that regard?

Dr High: From the perspective of the Alliances, Horizon Europe is such an important funding scheme, because it enables the building of research teams. The grants have such a size that it is not just about an individual researcher doing his or her research project. It is about building the capacity for excellence in a particular area. When that access was suddenly put into jeopardy, it really affected the research landscape in Scotland. From a UK perspective, we are already competing very much with the golden triangle. If we are already competing and then have this added insecurity of the bigger funding, we lose out.

Q65 **Alan Brown:** Are you able to quantify the potential income streams we have missed out on and how long it could take to recover back to where we were?

Dr High: I don't know how much we have lost. I guess that kind of calculation is always difficult to make. We have heard already from some of our business partners in the Alliances that they lost access and did not have the guarantee from the UKRI on pillar 3.

Q66 **Alan Brown:** We have potentially missed out already on some projects, but is it the case that because some European institutions have been successful and have continued to participate, they therefore have projects they can build on and continue to reapply for future funding streams for, so there is a continued catch-up needed for Scotland, which is a disadvantage?

Dr High: Exactly.

Chair: Thank you very much. I thank all of you for a fascinating and invigorating start to our inquiry. There were a couple of things you said you would get back to the Committee on, and our Clerks will surely chase you up on that, but for anything else you feel you could positively contribute to this inquiry, we are open to any suggestions or further input.

Thank you ever so much for today. I think you can tell by the interest that has been generated around the Committee that this is really good work for our start to this inquiry. We are all looking forward to continuing to engage.