



Select Committee on Science and Technology

Corrected oral evidence: Life Sciences and the Industrial Strategy

Tuesday 10 October 2017

11.10 am

[Watch the meeting](#)

Members present: Lord Patel (The Chairman); Lord Borwick; Lord Griffiths of Fforestfach; Lord Fox; Lord Hunt of Chesterton; Lord Kakkar; Lord Mair; Lord Maxton; Baroness Morgan of Huyton; Baroness Neville-Jones; Lord Oxburgh; Lord Vallance of Tummel.

Evidence Session No. 2

Heard in Public

Questions 9 - 14

Witnesses

Professor Chris Lowe OBE, Emeritus Professor and Director of the Cambridge Academy of Pharmaceutical Sciences, Cambridge University; Professor John Atherton, Pro Vice-Chancellor and Dean of the Faculty of Medicine and Health Sciences, University of Nottingham; Professor David Price, Vice-Provost (Research), University College London; and Professor James Stirling CBE, Provost, Imperial College London.

USE OF THE TRANSCRIPT

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

Examination of Witnesses

Professor Chris Lowe, Professor John Atherton, Professor David Price, Professor James Stirling.

Q9 **The Chairman:** Good morning. Thank you very much indeed for coming to help with our inquiry today; we appreciate it very much as you are giving up a lot of your time. Could I please ask you to introduce yourselves and your organisations and if any of you wish to make opening statements please feel free to do so?

Professor Chris Lowe: My name is Chris Lowe and I am a professor of biotechnology at the University of Cambridge.

Professor John Atherton: I am John Atherton. I am pro vice-chancellor for medicine and health sciences at the University of Nottingham. I also work for a body called Midlands Health Innovation, which is a co-ordinating body of Midlands's universities.

Professor David Price: David Price. I am vice-provost for research at UCL.

Professor James Stirling: James Stirling, provost, Imperial College London.

The Chairman: Thank you very much. Do any of you want to make any opening comment?

Professor Chris Lowe: One comment about the scope of this review is that life sciences, to me, covers everything from biology, so that is micro-organisms, plants and animals as well as humans, of course, and this report is focused entirely on human healthcare. Being a professor of biotechnology, I keep an eye on that and see what is happening, and that area is expected to be valued at about £727 billion per annum by 2025. If you look at the section which occurs in healthcare, it is about 65% of that. In other words, 35% of that total sum, whatever it works out at, about £220 billion or so a year, is non-healthcare biotechnology. That includes bioremediation, biofuels, biomaterials and a number of other sectors which, to me, encompass life sciences. That is all I wanted to say.

Professor James Stirling: That is exactly the same point that I was hoping to make. At our university, we have a very broad definition of life sciences and this is clearly focused on healthcare and medicine. We would regard, for example, climate change mitigation and adaptation and the impact on animal and plant life as also being part of life sciences, also agritech, food and nutrition, and so on; so it is a particular definition of life sciences but a rather narrow one from our perspective.

Professor David Price: I would echo that, but highlight specifically that this is about the treatment of human disease and it does not even treat the whole issue of disease prevention, so it is a very narrow subset of the subset that it is looking to address.

Professor John Atherton: I agree that it does not cover all those areas, but, having said that, it is an extremely important report that covers a

whole lot of very complex areas which are very important for industry and for the health of the nation, and we should welcome the report wholeheartedly and I do. There are some things in it which I would like to discuss further, regionalism, training, some things which could be stressed a bit further, but I wholeheartedly welcome this report, given the area that it covers.

The Chairman: Thank you very much. The one important point that the three of you made is quite right, that this is a narrow life sciences-related industrial strategy and that it ought to have been much wider. Having said that, of course the record will record what you have said and we will deliberate on it. The inquiry we are focusing on is the life sciences and the industrial strategy to see if we can tease out the pros and cons of it, so our questions will be related to that.

If I might start, I assume that the university sector was involved in one way or another in developing this Life Sciences Industrial Strategy, but you may feel differently, and feel free to comment on that. How do you think we, as universities UK, rank in a global area in taking our good science to innovation and commercialisation?

Professor David Price: First and foremost, the issue about the way that the universities were involved in the discussion, to my knowledge, nobody at UCL was formally involved in the creation of this strategy and I am not sure how the higher education sector was engaged.

On the wider question, British universities are perhaps undersold in their significance in the development of wealth and creation. There was a recent report by Reuters that placed three UK universities in the top 10 of those in Europe which are leading in innovation, so the UK's university sector is a significant one in driving innovation in the wider sector of industry.

Professor James Stirling: As far as we are aware, we were not formally approached during the formation of the strategy. Some of the points that you will hear from us this morning, such as the one we have heard about the definition of life sciences, could usefully have been made at an earlier stage.

To follow on, and to agree with what David has said, we do undersell ourselves. There are myths out there that we compare badly in getting fundamental discovery to innovation with the US. There was a very interesting report a few years ago commissioned by HEFCE, the Macmillan report, which did a quantitative comparison of the performance of the UK in innovation compared specifically to the US and Japan. One can be misled by the big blockbuster stories, like the Googles and the Facebooks and so on, which grab the headlines and have been obviously remarkable successes. But if you look at the research volume required to generate one spin-out company or to generate a patent and you compare the numbers, you find that, in fact, the UK and the US are entirely comparable, and that does not surprise us. We may not have as many big headline successes, but, on average, if you look across the sector, we do just as well.

The Chairman: Professor Atherton, you wanted to come in.

Professor John Atherton: I disagree because I think there has been widespread consultation on this report. We certainly had a chance to comment on it before it was published and, very broadly, this landed well with the sector and the sector felt well-consulted.

I agree with my colleagues that research productivity is very good compared with our competitors. As you move out into things like jobs per money spent, gross value added per money spent, we compare extremely well with our competitor countries, so the fact that we do not do well in commercial-facing research is slightly mis-sold. We could do better though. When you see how well we do in research productivity, we do not do as well relatively in this area, but many of the things in this report will correct that. Some things are already on the way. Research councils, charities and the NHS and their links with industry have improved enormously over the last six or seven years and this report, to me, makes another step change in that development. It is not as bad as we sometimes paint it, but it could get even better and this report, if implemented, will give a step change in that direction.

Professor Chris Lowe: My own university was quite actively involved in this, mainly through the medical school and the Regius professor Patrick Maxwell, and the Cambridge University health partners, Cambridge University hospitals and the Eastern Academic Health Science Network, so a number of parties we have contact with have been involved and engaged in this. Three suggestions particularly were the data and digital healthcare aspects of it, a new Medtech hub, which hopefully will be established in Cambridge, and the precision cancer hospital. Those three suggestions came from Cambridge.

In my new role, which I did not mention earlier—I am director of the newly established Cambridge Academy of Therapeutic Sciences—I interface with all those and with local industry, both small and large, so we are very interested in seeing some of our scientific developments go through into commercialisation and translation.

I have been involved in Cambridge Enterprise for a number of years now. It has only been running for coming up to 11 years now, but prior to that and since 1984 I have been involved in technology transfer at the University of Cambridge and seen a number of companies. The figures I have in front of me are of over 300 high-tech companies coming out of the University of Cambridge over the last 20 years, and some of those are quite valuable. For example, I mentioned Horizon Discovery, one which I did the original due diligence on, and that is located north of Cambridge and is valued at about £340 million now. Again, we have high hopes of that going through to a \$1 billion bioscience company, so there is a lot of activity within our region. If you look at other technologies, there were 240 spin-outs from the Computer Laboratory, for example, over the last 10 or so years, so it is a very active area. Since I have been involved in Cambridge Enterprise for the last 10 years or so, we have spun out about 100 different companies in various sectors, not just in bioscience, but bioscience is the leading sector that we have.

The Chairman: Professor Price mentioned the Reuters report on the ranking of universities in taking science to innovation and commercialisation. What you have said, despite all that, is Cambridge, and I grant you that you are number one of the UK universities, is number 21 in a global university ranking. Taken globally, as UK universities, why do we perform so badly in taking science to innovation? I think Lord Mair may have a question about that.

Q10 **Lord Mair:** In our earlier session, we had Sir John Savill say that, in his view, the consequence of this report and this industrial strategy will be that industry will set the priorities. Do you agree with that?

Professor Chris Lowe: No, not particularly. I have worked with industry since 1970, and I say "with industry", not "for industry", which is a big difference. I like to think that, in the position that I have been in, I have led industry into new sectors and you need that aspect as well. Of course, industry will know how to take those new developments through into commercialisation and they have the resources to do so, but you still need to lead them in many cases. In my new role, I have spoken to pretty well all the major pharmaceutical companies in the world now, one after the other, and I can rank them as to where I think they have vision for the future and where they do not. I am not going to quote them, by the way. Privately, I could do.

Professor James Stirling: I interpret the report as implying that industry would be driving this. From our perspective, it has to be a partnership. One can cite examples like the Apollo Therapeutics Fund where three of the big pharmas have collaborated with UCL, Imperial and Cambridge to set up an investment fund. That is a very good example of working in partnership with industry.

Professor David Price: I agree entirely. It is essential that innovation and new ideas come out of research from universities and it is how they fit into the developing opportunities of exploiting those with industrial companies which is the essential feature. We cannot have problems defined just by the end user because they will not be able to think about innovations beyond that space, so two-way communication is essential.

Professor John Atherton: It is about co-creation and some of the best ideas come from industry as well as from academics and universities, and it is about building places for collaborations where that co-creation can turn into something bigger. Things like the science parks you see springing up around universities, enterprise zones, and bio-incubators, which are often outside universities, BioCity in Nottingham, for example. All of those allow co-creation and allow the driving of this agenda, and it is the getting of people together to co-create and drive innovation and commercialisation which is critically important. I do not think we can claim to own this as in the university sector, but we can claim to be a partner with it and to be something which facilitates it, and that is what we aim to do in our universities.

Lord Mair: Is there anything particular about this industrial strategy that is going to improve the pipeline from the science at universities through

to commercialisation? Is there anything particular that is going to improve that?

Professor David Price: The highlighting of the role of the NHS in this is vital. If it is to be made to work, which is the biggest challenge, the pipeline will be much clearer. Some of the points made in the strategy about making that transition from innovation into early practice and delivery into the NHS is absolutely key.

Professor John Atherton: There is a lot in the report about removing barriers, which is a way of improving it. I completely agree there is a lot of importance surrounding the NHS. The NHS is where the things that we are developing together get trialled, kite-marked and moved forward into uptake, and the NHS is not only the body with and in which we develop these things, it is the consumer at the end of it as well, so that gives quite an advantage. This strategy, to me, is helping with all those things. It is removing barriers, it talks about regulation and legislation, about funding through the NHS and making things work better through the NHS and how to fund these things in very big, imaginative ways. So this strategy improves the pipeline towards commercialisation quite considerably.

Professor Chris Lowe: One area where it is weak is in entrepreneurship. Although it is mentioned in the report, it is almost in passing and, if you are going to generate a lot of new ideas which will eventually feed through to larger multinational industry, you need the entrepreneurs to set that up and get that running. It is a matter of culture. I have noticed over the years I have been in Cambridge that now you see a real emergence at the younger end of the spectrum, the young students who are keen to get involved in this, and you see it at the top end as well. At pro vice-chancellor level there is obvious interest in it, but in between you have a fairly large bloc where people have no experience of it and have not needed it in the past and, from this young student point of view, somehow we have to get that culture change over the bulk of the university system.

Lord Kakkar: How do you propose to do that, because it is a fundamental question?

Professor Chris Lowe: In my new role with the Cambridge Academy of Therapeutic Sciences, we are initiating a whole series of schemes where we get exchange between the staff of the university and industry and vice versa, and that is not just academic staff but we are talking about legal staff and administrative staff as well so that they understand the environment in which others work. We have a whole series of different schemes where younger people, particularly postdocs and postgraduates, can go and work and spend six months in industry as part of their PhDs. It is a matter of changing the mindset and the culture to get these developments through.

Professor John Atherton: This is an area that innovative universities are concentrating on very hard. Cambridge for example. In Nottingham, we have the Haydn Green Institute of Innovation and Entrepreneurship, which is an imaginative concept building that brings together

entrepreneurs from industry with students and staff, puts in place training for those people, so people so they get training in knowledge transfer and commercialisation as well as in academia. I do not know of a single university that is not trying to put together things of that nature, centres of entrepreneurship for staff and students to change the environment.

Professor Chris Lowe: We are looking at this at all levels, in fact. It is already starting to appear in some undergraduate courses, Tripos courses. It is certainly in the postgraduate agenda through our Judge Business School and other activities. We have a new centre for postdoctoral affairs, which will introduce a fairly large section of entrepreneurship. We have a masters in bioscience enterprise, which I was actively engaged in and set it up originally in 2002, then we have the Judge Business School also very active as a centre for entrepreneurial learning, and we go right through to the issues in Cambridge Enterprise, which is actively engaged in training programmes as well, so it goes right through the whole spectrum now within Cambridge.

Professor David Price: In addition to that dimension, which I am sure other universities are also pursuing, it is important to ensure that the NHS staff are embedded back into the research base as well, so the NIHR academic clinical fellows and clinical lecturers, of whom we have 148 at UCL, play a vital role in embedding fit, practical clinicians into the research environment. That might well reflect why the UK is doing particularly well in the clinical trials of the advanced therapy medicinal products because we have that closer link with the universities and the hospitals. The UK is second only to the US in the number of clinical trials in this space and, in fact, UCL, I know, run more ATMP trials than all of Germany put together.

Q11 **Lord Hunt of Chesterton:** One of the ways in which Europe has developed collaboration and translation from research into practice has been through networks. I notice, for example, that Professor Atherton has talked about these different networks and centres. Do you agree with my impression, as I have been involved in this, that the Government, perhaps even more so with Brexit, are not as strong as they might be in encouraging the participation of universities and their spin-outs and so on in very strong European networks? I think there has only been one meeting at the Royal Society since I have been there in the 1990s to talk about the involvement of British scientists in networks to improve them. I wonder whether you feel this is an area that has been missed in the strategy and do you think there are things that we could do about that?

Professor James Stirling: In our experience, and I think this is true of the university sector as a whole, we have engaged very effectively with European partners through the various European funding schemes, and it is one of our concerns going forward that we would still have access to collaborators and funding. Also important to us is the ability to recruit the very best scientists, engineers, medics and so on from anywhere in the world. I would claim that we have been very successful in forging partnerships and collaborations with Europe and, indeed, the rest of the

world. If we are to make a success of this strategy, we absolutely need to continue to do it, and the report refers in a number of places to the importance of maintaining the ability to recruit world-class researchers into the UK, including from Europe.

Lord Hunt of Chesterton: That is not quite the same as having an established network. There are ones in areas that I know about and they are often run out of Brussels and are very effective. There is no equivalence of funding or effort to do that here.

Professor David Price: The Horizon 2020 programme, where the UK has been extraordinarily successful, part of that is from the European Research Council, but the others are from networks and collaborations. Certainly within the biomedical health area, UCL —

Lord Hunt of Chesterton: But that seems to be a five-year programme and I am talking about networks. I have been on networks for 30 years. The point is the ones that Professor Atherton talked about are, presumably, quite long-term networks to deal with these things.

Professor David Price: With respect, many of those networks roll forward between funding activities, so the community exists even though the funding is periodic.

Professor John Atherton: There are networks that are set up around professional organisations, around research areas which spread right across. Indeed, I am secretary-general of one in the GI area across Europe United European Gastroenterology. Those are enormously valuable to us. Through UEG we do a lot of lobbying in Brussels. Of course, this is one of the areas that worries us, whether we can continue to be involved in those networks at the level we are. The scientific community in Europe is very welcoming to us remaining, but it is something we have to keep a very careful eye on.

Lord Hunt of Chesterton: The impression I have is that some civil servants and groups are keen to keep this and others may fall by the wayside.

Professor John Atherton: I share your worry.

Professor Chris Lowe: With respect to Brexit, I always assume the worst and the worst case scenario. In my own case, I have been looking at the rest of the world. We have very good ties with Australia and New Zealand and we have ties with China and South East Asia, and quite a lot of the South American countries which are up and coming now, and so on. The idea is to form networks and links with those as well and we can then engage in money from the ODA and various other sources. There are opportunities there which we have to take advantage of.

The Chairman: Lord Hunt, do you have any other supplementaries?

Lord Hunt of Chesterton: No.

The Chairman: Okay, so Lord Kakkar.

Q12 **Lord Kakkar:** I want to return to the question of collaboration between the NHS and this overall life sciences strategy. In the written evidence

that has been submitted, a number of problems have been highlighted in terms of the financial pressures now facing the NHS and, therefore, the ability of NHS institutions and organisations to participate in substantial research activity; the ability of NHS staff to make those contributions or, indeed, university staff, who are clinical academics, having greater NHS pressures put on them; the broader ability of the NHS to deliver a meaningful research capacity to support many of the recommendations in this report, including the Accelerated Access Review; how innovation will be adopted at scale and pace across health economies to make industrial commitment in the life sciences sector meaningful going forward in the United Kingdom; and then sufficient flexibility to allow individuals both to develop and participate in a clinical career and at certain times devote themselves to research enterprise as their interests develop and change. Those have been highlighted. Have you any specific solutions to those problems to ensure that implementation of this report takes account of appropriate mechanisms to ensure that those issues do not undermine the success of the life sciences strategy?

Professor David Price: Far be it for me to try to find a solution to the funding of the NHS, but there are elements in the system which work particularly well and should be preserved and encouraged. I refer particularly to the biomedical research centres which you know that UCL hosts three of with UCLH, Moorfields and Great Ormond Street. They have been extraordinarily successful in accelerating the clinical trials and the translation of research into the treatment of patients. Since 2011, the number of clinical trials in the primary stage at the UCL-UCLH biomedical research centre have gone from 25 to 83 and in the secondary stage from 75 to 173, so a huge increase in effective translation because of the investment from the BRCs. That is one area which should be preserved and perhaps fostered further.

Lord Kakkar: Do you think that area is given sufficient attention in the Life Sciences Strategy?

Professor David Price: It does not seem to feature as highly as it might.

Professor James Stirling: There is an important follow-on point from that. I agree with David that the BRC funding through NIHR has been enormously important for us, not least in enabling our researchers to work alongside clinicians towards translation of their discoveries. However, there is an issue about the full economic cost of research and, while NIHR funding is very welcome, it does not come with the overheads or the indirect costs to enable the research to be carried out with the funds that we receive. That is an issue that the report touches on.

In the charity sector, of course we are extraordinarily grateful for funding from charities, but, by and large, it only covers direct costs, so universities somehow, to fully exploit that funding, have to find additional resources to cover the indirect costs. The Charity Research Support Fund, which is referred to in the report, is a way of addressing that, but it falls far short of providing the full costs of doing the research, which is an issue that universities are facing right across the sector.

Professor John Atherton: The NIHR, in its short life, has been transformational and has really changed the environment in hospitals. The BRCs are one example which have worked very well and some of the other examples at the post-translation adoption end have also worked well but may still need a little bit of adjustment, and I am thinking here about things like AHSNs and CLAHRCs. Investment of money in this area has been remarkably successful. The direction it possibly needs to take and is taking is for industry and commissioners in the NHS to be taken on as partners. This needs to accelerate, and the NIHR, under Chris Whitty, has recognised this as an important area and is moving in that direction.

Something that people have not mentioned is that, in all of this, clinical academics, who are people who often have 50:50 contracts, are employed by universities and work within the NHS and within universities, are the absolute key deliverers of this, and clinical academic numbers are going down. If you are looking for people who will deliver across universities, the NHS and industry and more broadly, this is a key group of people that we need to be supporting and training, and I feel very strongly that it is a group that we should be doing more with and we should not be seeing the contraction we are seeing at present.

Lord Hunt of Chesterton: That is quite a new idea that you are training people to do what has hitherto, as has been mentioned, come out of serendipity.

Professor John Atherton: Yes.

Lord Fox: You mentioned that important point about the reduction in these people. Is that because there are fewer people wanting to do it or less money available to fund them to do it?

Professor John Atherton: You could argue it either way. To be fair, the NIHR has put money in at the early training end of this to fund people coming in at the start of their medical career. There is leaky pipeline as you get towards the top where there are big gaps in funding clinical academics trying to get to independence at that stage. It becomes a little bit of a chicken and egg question: are people dropping out of this because they do not want to go into it or because there is nowhere for them to go at the end of this? My view is that there are lots of talented academics out there who would like to be in this area and would very usefully be in this area and the problem is a lack of funding at various levels in that pipeline.

Lord Kakkar: Can I come back on clinical academics, and I should declare that I am one? Do you think that in the development of a clinical academic there is clearly the emphasis on developing the clinical skills and the emphasis on developing the academic skills, but is there the emphasis on developing the broader skills that will be necessary to interact with a life sciences strategy successfully?

Professor John Atherton: The entrepreneurship skills is an area that traditionally has not, in the early days of the NIHR, been well-developed, but which is being much better developed now. Universities are also

concentrating on this area. This is following on from what Universities and funders are doing with non-clinical PhD students where we are supporting three-plus-one and four-plus-one partnerships with industry (where a year is taken in industry as part of the PhD). Increasingly, in the taught part of PhD training programmes, you get innovation skills are being brought in and that is now finding its way, slightly slowly perhaps, into clinical academic training as well.

Professor Chris Lowe: I ran our master's in bioscience enterprise for 15 years from 2002. We took, generally speaking, about three, four or five medics a year on that programme and they were the best by miles, I have to say. They were very good in general skills, they could see the vision. I am boosting your ego a little bit now, but they were the best because they had that very good general overview, and most of them came to us saying, "If only I had this or that, then I could do my job so much better", and often those people have gone on to establish companies and do exactly that.

Baroness Morgan of Huyton: This is probably mostly for Professor Atherton. To what extent do you think NHS England understands the importance of what we are talking about now? Is there a real danger in the current parade of intense pressure that this is an area that feels it can be squeezed and we can do that again in the future?

Professor John Atherton: The last thing I saw from NHS England was a bit general in this area rather than very specific, and this is a problem. At the highest level, the NHS and NHS institutions understand this agenda and feel that it is important to them. There is some selling we still need to do. Hospitals are very taken with clinical targets, but patients do better in clinical trials, patients do better in an academic environment and hospitals do better where they have more academics, so all those things should encourage the NHS to support research and innovation. At the top level, the NHS has bought into this. Part of the problem sometimes is that the middle level in the NHS, the middle managers, get focused on other things, and the answer may be is to bring this into the structure of the NHS, bring it into the aims and goals of some of those middle parts of the NHS so that it is truly embedded. That is possibly the way forward.

Professor James Stirling: Another place where resource is very important is the NHS's vast amount of electronic health data which we absolutely have to exploit, and the report makes that very clear, but exploiting any kind of data, particularly health data, is resource-intensive; it requires professional data analysis, high-performance computing and bioinformatics. Universities are great places to work on issues like that, but it does come at a cost.

Professor David Price: I know that Sir Malcolm Grant, my former provost at UCL, is acutely aware of and values the strong links.

The Chairman: Being aware is different from delivering.

Professor David Price: It is, but, as I was going to say, one of the challenges, having been a non-executive director of one of our hospital trusts as well, is the Balkanisation of the entire structure and, therefore,

it is difficult to get a direct command and control right through to delivery at the hospital level.

Lord Kakkar: In that regard, because the universities are very frequently represented on the boards of NHS trusts that are associated with them, do you think that there would be merit in the way that reports are made to those boards on financial matters pertaining to the trusts and then clinical and safety matters and outcomes and that there is also a requirement for trust boards to receive information on their research output and their contribution to the life sciences strategy?

Professor David Price: Certainly that is what I felt when I was sitting on the trust of one of our hospitals, that it did not get the profile that it probably should have done, given the close links to the university.

Professor John Atherton: I think that is an excellent idea. Trusts do get that they have the aims of delivering research and training as well as the aim of clinical delivery, but inevitably at trust boards it is clinical delivery that crowds other things out. So making it a prerequisite for the board meeting that research, innovation and commercialisation and education were on the agenda would be an excellent idea.

Professor Chris Lowe: Giving some of the NHS managers a little bit of entrepreneurship training would not be a bad thing either to broaden their horizons a bit, because it is a very conservative organisation. Speaking personally, I have tried to get in from a research level and they have told me that it is too far-fetched for what they want, and I have also tried with a small company hat on as well, which is equally difficult. When you think that the NHS is a unique resource for the UK, it should not be like that at all; it should be relatively easy to access it at the research level and at the commercial level, and it is not.

The Chairman: The crucial comment is, moving forward, we need our universities to become more effective in having an important role to play in getting the good science that we have in the universities, and you have all commented on that, to innovation and commercialisation where, Professor Price, you started by mentioning that we are not doing as well as our competitors in the rest of the world and you, Professor Lowe, gave us examples of how well particularly Cambridge and your centres do. How do you translate that to the UK-wide university sector to become better at taking science to innovation and commercialisation, and what needs to be done, or do you think the universities should be left to do what they do now because they are good at it and to not put pressures on them, but they need to become a bit more commercial-savvy?

Professor James Stirling: One thing the report highlights which resonates with us is the importance of clusters; clusters of universities, NHS partners, business and industry, and more universities are now creating these clusters. At Imperial College, we have our new White City campus where the primary purpose is to bring together partners from the commercial sector, from the academic sector and from the NHS. One cannot stress too much the importance of the geographical co-location of scientists from industry, from academia and from the health sector, being

on the same campus, moving in and out of each other's buildings. Proximity is so important in this.

Professor David Price: I entirely agree with that point. If one talks about research as a pipeline and the universities are generating at one end, it has to have somewhere to flow. You need to look at the amount of research and development investment from industry in the United Kingdom in comparison with our competitors and you will see that that is not as high as it might be. One is looking for an increase in the investment from major global companies as well as the innovation ideas coming out of the universities. They have to be picked up and it is not just a push, it has to be a flow, and that is one of the challenges that we face in the UK.

Lord Griffiths of Fforestfach: Carrying on from that answer, I was very interested in Professor Atherton's evidence, and perhaps I can quote the sentence: "Since 2011, several major life science industry players have relocated much of their R&D from the UK, Pfizer, AstraZeneca and Novartis". I wonder why that is.

Professor John Atherton: We have not done enough in terms of our infrastructure. I agree with my colleagues that some of this has to go to regional infrastructure. In engaging the big pharma as well as SMEs, we need to do more. In the Midlands, for example, we have the Midlands Engine, which encompasses a partnership between big companies, SMEs, other industry, the research-intensive universities in the Midlands and the biggest NHS partners. If we had had that before in the UK, these companies might not have re-located much of their R&D. It is partly a question of recognising where your strengths are regionally and getting people into that region. For example, the Midlands has more medtech companies than anywhere else in the UK regionally, so we have set up the Medical Technologies Innovation Accelerator to try to keep medtech companies in the region.

The other place your question goes to is what we do with our intellectual property and where that goes. To some extent, universities are very tempted to license out intellectual property, which means it can go abroad very quickly, and one of the problems is trying to turn that away from licensing out into much more spin-out-type activity, which can then feed big pharmas from SMEs. It is a complex question with several answers, but strong regionalism is one of them and how we behave in universities is another.

Q13 **Lord Borwick:** I have no relevant interests to declare. On your relationship with research funders, do you think that they will respond to the strategy or will they ask you to do things that are even at variance with the strategy? Will you be able to persuade them that what they want to do is in co-ordination with the strategy by a different use of English? Will there be conflicts here or not?

Professor David Price: I do not think we will find conflicts. The funders respond to us in different ways. Some respond to ideas and, hopefully, we will have many of those because that is what drives the innovation.

One of the challenges at the moment is that the research councils have a rather fragmented approach to what they refer to as “impact acceleration”, so each research council gives out sums of money in little ways, and it would be certainly helpful for universities to have greater flexibility on impact acceleration funding from UKRI as a whole rather than as a research council baseline. That would enable us to respond to the industrial strategy more directly than otherwise.

Professor Chris Lowe: It depends entirely on the research council. If you take the BBSRC, which is largely focused on life sciences in the broader context of it, I would not expect them to change their strategy too much. With EPSRC, maybe you would expect them to go a little more towards convergence and how that may impact on diagnostics and so forth. The major ones with a clear focus on clinical I would expect to follow this reasonably closely.

Lord Borwick: But you are talking about the government-associated funders?

Professor Chris Lowe: Yes.

Lord Borwick: What about the charities, the private trusts and those sorts of people?

Professor Chris Lowe: We have had discussions recently with the Wellcome Trust, and it is pretty mainstream.

Lord Borwick: Pretty well inside this?

Professor Chris Lowe: Yes.

Q14 **Lord Vallance of Tummel:** We move on to the thorny question of implementation. First, sticking at the life sciences sector level, do you think that somebody or some body should be responsible for implementation? If so, who should that be and to whom and to what should that body be responsible? Once you have answered that one for us, take it to the supra-sectoral level for the UK industrial strategy as a whole and then, the final sting in the tail, what, if any role should there be for universities at either or both of those levels?

Professor James Stirling: It is interesting because the strategy is quite light on implementation, governance, responsibility and ownership. I regard these as details still to be worked out, so your question is completely relevant. The creation of UKRI is helpful in this respect. UKRI can act as an oversight organisation. It contains Innovate UK and can provide the bridges into industry. It is important, of course, that the NHS is represented in whatever forum is established to take this forward. I would like to draw attention to one analogy, which is a reasonable analogy, though not perfect. When the Government invested £1.5 billion in the Global Challenge Research Fund, that clearly had sponsorship from more than one ministry as BEIS and DfID both had a stake. The solution there was to create a high-level strategic advisory board which would work with the ministries and the delivery partners, which are not necessarily just the research councils. I sit on that advisory group and it has been effective in drawing together the stakeholders from right across

government and in the private sector to address and define the strategy, the implementation, the goals and the milestones. Something similar might be relevant here.

Lord Vallance of Tummel: I am afraid I get very managerial. If you are talking about an advisory board that could be something to whom the person who is responsible for the thing is accountable. The advisory board takes a look at how things are going on, but what is the body and who is the person who is going to be responsible for implementing the life sciences sector strategy?

Professor David Price: Talking about implementation, it is important to come back to the first part of the conversation that this is only a subset of what needs to be considered. We need to consider how to deal with public health and wellbeing as well as disease and illness. The danger is if we just focus on what has been presented in the Bell report and look at the management and delivery of that, we will be delivering solutions to disease treatment and not addressing the national need of public health and wellbeing. I would be very careful to make a recommendation as to who should oversee it because it should be overseen by a body or individual with a larger remit, of which this is a subpart, I would say.

Lord Vallance of Tummel: I can see that, but the worry is that, given the past performance of UK industrial strategies, within two or three years they run into the sand. The easy bit is describing the strategy itself, but, unless you have clear accountability, it does not get done.

Professor John Atherton: The easy bit is co-ordination within the bits of this. You have UKRI and you can co-ordinate charities with that, so the funding side can be covered. You have regional organisations, such as the Midlands Engine that can bring industry and universities and the NHS together, so that covers the regional side. Regulation needs to be done by government. So managing those individual things is straightforward. I agree with you completely that it is how you bring it together and drive it which is difficult. The strategy is across government departments and across sectors and is a complex thing to deliver. The obvious place to co-ordinate would be the Office for Life Sciences, but does that have enough clout in the various parts of government and industry? I was sitting in on the earlier session when his Lordship recommended a Cabinet committee, and that sounded to me like a strong idea in that it would allow a very high-level driving of the agenda. I am speaking from ignorance here, but, if it is a cross-party committee, it might have a life after a Government, but the problem with a Cabinet committee, potentially, is that it might only have a limited life, and this is something which has to have a life over 10 or 15 years to work. Your Lordships probably have much more of an idea than we do about how that can be implemented at government and national level.

Lord Vallance of Tummel: Leaving aside for a moment who is accountable and thinking of responsibility, would there be any sense in having, say, an implementation forum at the life sciences level, the sectoral level, which included universities, the research councils, industry, the NHS and, crucially from my point of view, the financial sector as well

which would look at the way in which things were going on and was independently critical of implementation? There are two sides to this: there is the responsibility and the accountability. A body of that kind could last for ever and it would bring together people from very different sectors and it could independently look at how things were being implemented. The other issue of who is responsible for implementing it is more difficult.

Professor John Atherton: It sounds to me like an absolutely excellent idea. It would provide that challenge element which would be important as well. I guess that one thing we would have to be careful of is that it did not end up being one view that was coming back because this is such a complex area, but if that can be mitigated it is a brilliant idea.

Professor James Stirling: I agree that it is an excellent idea. My only slight concern would be the risk of creating a silo and trying to define and draw a line around life sciences. As we said at the start of the session, for us this is a very broad church and the chemists, the mathematicians, the computer scientists and material scientists, who are referred to as being "key components" of this multidisciplinary approach, would not see themselves as life scientists; they would see themselves as scientists. We have to be careful not to create a number of separate silos, for what we might think are separate and unconnected sectors; that would be my only concern.

Lord Fox: That was perfectly inferred because it was coming back to what Professor David Price said earlier that it is a much bigger thing, the point that you made. What we have already come to understand is that perhaps this is named wrongly and you want to call it something else, but, whatever it is, it seems to me that you agree it is worthwhile trying to implement it. That is the first point. Secondly, it is very complex, even though it is not as complex as you seem to want to make it, by throwing in a whole bunch of other stuff. What is the sensible approach: to bite the bullet, accept that this, limited as you seem to view it, is worth implementing and, therefore, accept that in this form it is going to be narrow, or do you stand and say, "No, it has to be broader in order for it to be relevant"?

Professor James Stirling: From my perspective, within universities and in particular in my university, we do not talk anymore about life sciences as a sector within the university or, similarly, the physical sciences sector. We, instead, tend to focus on global challenges. What problems are we trying to solve? Is it an ageing population, antimicrobial resistance, cancer therapeutics? Having defined the problem, we assemble the team of people who will address it and try to avoid labelling people by whatever sector they think they are in or they are supposed to be in. The Government have had some success, I think, with the grand challenge approach to, for example, quantum technology, where the problem is identified, the right people are brought together and funding is provided.

Professor David Price: Indeed. The industrial strategy, ideally, would be a mission-focused rather than a sector-focused strategy because we

need to look at the problems that we want to solve and they do not all fit into aerospace, health or whatever. Therefore, although we may have a strategy on how to address the challenges of human disease and the treatment of human disease, it is not sufficient by itself to address the challenge which the nation needs to study and, therefore, if we are going to take this strategy, we need others that complement it.

Professor Chris Lowe: I would like to see an office of the industrial strategy a bit like the Office for Budget Responsibility with those sorts of powers and life sciences would be part of that, so life sciences will impact many other industrial sectors and many other industrial sectors will impact life sciences in the future. Therefore, you have to have that link.

Lord Fox: That is your supra level?

Professor Chris Lowe: Yes.

Professor John Atherton: I agree with my colleagues in many of those respects. This is a very complex area and this life sciences strategy is mostly about life sciences as they pertain to health – and this is a particularly complex area. To me, this life sciences strategy is an excellent road map which is taking us through all the important areas needed to deliver on innovation and commercialisation. I agree completely with my colleagues that many of the most important new advances, are links between the life sciences and other areas such as physical sciences and maths and computer science. Linking these broad areas is what we do in our universities. This life sciences strategy steers us through this very complex area of life sciences as it abuts health and integrates into the NHS. This is the sort of road map that we need. Sure, we need to bring in other things around it, but this is exactly what we need to navigate through this area and to navigate industry into this area.

Lord Hunt of Chesterton: We heard at the beginning of this session and the previous session of these major companies leaving the UK in the last 15 years. Do you have some confidence that with this new industrial strategy we would have prevented some of those exits?

Professor John Atherton: Yes.

Lord Hunt of Chesterton: Why?

Professor John Atherton: I certainly have confidence in that. Very much the first part of Sir John Bell's report is on a grand challenge agenda, he puts out major programmes there. I think we all agree that early diagnostics could be better framed around prevention, but putting lots of money in a very disruptive, DARPA-like way into these sectors would attract these companies to stay here. The training that we have talked about, training clinical academics and PhD students, will encourage people to stay here. A change in regulation, a change in how things are trialled and integrated and sold to the NHS and to patients in the end will change things. So this strategy over many of its areas would avoid those sort of exits.

Professor David Price: I do not see how we could answer your question without discussing the challenges of Brexit because the access to markets and the population base that drug regulations give are critical where research and development has happened. Although, at the moment, we are part of that European community where the potential population base is 300 million or so, I do not know if the UK will be as attractive for that sector post-Brexit because of those limitations.

Lord Kakkar: The objective of this life sciences strategy is to drive economic growth, contributing more broadly to our country. Do you think that that is going to be achievable in the way that this is laid out and, in particular, in the context of the question you have raised about our future relationship with Europe?

Professor David Price: This is written very much as a status quo for the UK economy and I do not know if it would survive the disruption that might occur should we withdraw from the European Union.

Professor John Atherton: I think it is achievable. It would be much more easily achievable if we were within Europe, but we all do things outside of Europe to try to build internationalisation. Nottingham has a campus in China and the Midlands Engine has been out with a trade mission to China. We are trying to build these links internationally where things might be less easy to build in Europe. As I see it, this gives a structure in the UK which allows those things to happen, so I am positive about it.

Professor Chris Lowe: I am fairly confident. This report gives a whole series of numerical goals which, if followed up correctly, would be a game-changer in the UK, in my view. The question is, are they going to be followed up, and the goals that are listed in this report, are they going to be adhered to? That is the question. If you look at the last report, which is the 2011 one, that had a whole series of similar goals in it and, as far as I know, most of those have not been achieved. Some have, but not all of them. That is why you need someone to oversee it and enforce the conditions of it and then you might achieve it.

The Chairman: On that last comment, thank you very much, gentlemen, for coming to help us today; we appreciate it very much.