



# Select Committee on Science and Technology

## Corrected oral evidence: Life Sciences and the Industrial Strategy

Friday 17 November 2017

11.10 am

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

Evidence Session No. 15

Heard in Public

Questions 127 - 134

### Witnesses

Dr Mark Hammond, Co-founder, Deep Science Ventures; Dr John Bowler, Fund Manager and Global Sector Specialist with responsibility for the health care sector, Schroders PLC; Dr Peter Hughes, Healthcare Equity Analyst, AXA Framlington Biotech Fund; Dr Andrew Elder, Partner, Albion Capital.

### USE OF THE TRANSCRIPT

This is a corrected transcript of evidence taken in public and webcast on [www.parliamentlive.tv](http://www.parliamentlive.tv).

## Examination of witnesses

Dr Mark Hammond, Dr John Bowler, Dr Peter Hughes and Dr Andrew Elder.

Q127 **The Chairman:** Can I first of all welcome you and, before I make a few comments, ask you to introduce yourselves? If you want to make any comment when you introduce yourself, please do so.

**Dr Hammond:** I am Mark. I represent a firm called Deep Science Ventures, which I founded last year. We are a venture fund in what is called the pre-seed space. I spent 10 years working in technology commercialisation, both at Imperial College, as part of its technology of transfer office and investment arm, and also in the City around clean tech. We started DSV last year because of the challenges of getting academic technology out of the academic environment. We think there is a better way to leverage that opportunity, which I am happy to go into more detail on.

**Dr Bowler:** I am John Bowler. I am the portfolio manager for the Schroder global healthcare fund. I invest in quoted healthcare companies.

**Dr Hughes:** I am Dr Peter Hughes from AXA Investment Managers. I am a healthcare equity analyst and fund manager. Similar to John Bowler, I only invest in quoted securities.

**Dr Elder:** I am Dr Andrew Elder. I am the lead healthcare partner at Albion Capital. We manage about £1 billion of capital, of which half is in public equities and half is in private equities. I am involved in the private equity side. We manage £350 million of that in Venture Capital Trust, which typically invests in commercial stage or early commercial stage ventures, and the UCL Technology Fund, which is a university IP investment fund, investing in intellectual property emerging from University College London.

**The Chairman:** You are part of the group that we are taking evidence from related to the life sciences industrial strategy, John Bell's publication. Hitherto what we have heard is that while our science is good, we are not so good at innovation and are even worse from innovation to commercialisation. There are other challenges, but part of the problem and the challenge is on the investment side. We do not have the same venture capital investment or even further commercialisation as they have in the United States or Germany. That is basically what we want to explore. I will kick off by asking what the challenges, barriers and opportunities are in investment for the life sciences sector in the United Kingdom.

**Dr Hammond:** I can speak to you from the perspective of the issues experienced at the very earliest stage. The challenge is increasing the size of that pipeline. The challenge you have there is that university is not necessarily designed to create ventures; it is something that happens on the side. Someone happens to discover something that might be interesting. Virtually everything about that environment makes it

challenging to move that forward. Nearly all the metrics are opposing doing something around creating a venture.

The other challenge is that the loop between what industry wants and what academia wants to look at is really badly closed, even in industrial partnerships. One of the biggest frustrations for innovations is when an industrial partnership has triggered something, and you would naturally think that what came out of the end of that would be interesting to that partner. By the time something came out of it three years later, it was almost never of any interest to that partner. That loop is very badly closed. What we try to do is essentially take that out of the academic environment, to seed opportunities that the industry really does want to know, PhDs and post-docs that can pursue them, and then link them back into the academic environment to build that technology.

**Dr Bowler:** I will speak from the perspective of someone who invests just in quoted companies. In general, my experience in UK IPOs is that the companies are being brought to market at generally too early a stage. That is something the report recognises—the fact that there are fewer rounds of venture capital funding has been put as a potential reason. Companies, when they come to market, are not really at stage where a fund like mine can invest in them, because I run a unit trust; it is open-ended. That means the investors, as well as putting money into my funds, can take it out whenever they want. It is not a home for long-term capital. On my investment horizon, I cannot invest for five or 10 years.

**Dr Hughes:** My perspective is slightly different from Mr Bowler's in that we run a very specific biotech portfolio that looks specifically for new innovations. We are used to investing relatively early and in smaller companies. The issue that we often find is that we have a three to five-year time horizon, which is long term in terms of an investment for an open-ended vehicle. The challenge comes when you feel you have realised the potential of that investment and need to exit or reduce the position. That is when liquidity can be a problem. Having a secondary market that works well, in which we can trade shares actively, is very important from our perspective, particularly in managing risk, because it is an open-ended vehicle and investors are welcome to redeem if they so wish. We have to be able to manage those flows effectively.

**Baroness Neville-Jones:** What is your secondary market—AIM?

**Dr Hughes:** In terms of secondary markets, we typically invest globally. Typically it would be on US NASDAQ or we have some UK main market holdings. The Alternative Investment Market, or AIM, is an area we tend to play fewer investments in because it can be difficult from a liquidity point of view, as I have just mentioned.

**Lord Oxburgh:** Could you say what biotech encompasses?

**Dr Hughes:** Absolutely. Biotech is, as you can imagine, an amalgamation of technology from a biological perspective. We are talking specifically about products such as antibodies, proteins and amino acids. It has to have come from a biological source. It is essentially a technology you are

typically applying to a pharmaceutical use but it does have very wide applications.

**Dr Elder:** From our perspective we see the whole spectrum, all the way from university idea through to commercial company. The biggest fundamental structural issue in life science is that the time horizons from that idea to commercial are way beyond the time horizon on any money. Any investment money always has some kind of time horizon attached to it, whether it be a unit trust or pension fund all the way down to a venture capital investor who wants to hold for five or 10 years. There is always a defined time. Matching that extended time from the idea to the commercial result to the time on particular pockets of money is extremely hard.

Each pocket relies on the next pocket to see an exit. You have a conveyer belt system whereby, in order to bridge the entire gap, you have to have a series of mini-conveyor belts, each a pocket of money, and for those mini conveyer belts to act properly they have to be functional and deep enough. Issues such as the IPO markets failing suddenly create a big gap. Funds do not like to be exposed to that financial risk downstream. If they cannot receive the liquidity at the next step that we have just heard about, the fund will not invest upstream because it will not see a return downstream. All the pieces need to be functionally integrated and they need to bridge across.

Where we see a lot of the issues is where that integration starts to break down. For example, public markets feel unable or uneasy to invest pre-IPO, or look upstream pre-IPO, or, for example, early commercial stage venture organisations become uneasy to invest at the university spin-out stage because it is just too risky.

**The Chairman:** Are we different here than, say, the United States?

**Dr Elder:** Yes.

**The Chairman:** In what way?

**Dr Elder:** The depth of the pockets, and the scale. There is a big scale effect issue. The scale of the funds in the US is much bigger.

**Lord Griffiths of Fforestfach:** On all levels?

**Dr Elder:** Yes. The risk appetite to continue funding and to fund further upstream than they would typically do here is also much greater.

**The Chairman:** Is the life science strategy as outlined likely to help or hinder that?

**Dr Elder:** It is likely to help, but I have to admit part of the next step to work on is its tie with the Patient Capital Review, which was going on coterminous with this, so it was not able to report on that. Its position was open and positive enough to show good signs but it needs to tie into some output from the Patient Capital Review, which has been set up on a cross-industry basis to deal exactly with that issue of continuity in the financial markets.

**Lord Fox:** Returning to the motif that the Chairman just touched on,

which is the comparison with the US, first of all on the pass the parcel scenario that you just described, is it safe to say that in the US they tend to hold on to the parcel for longer and there are perhaps fewer players in the game? Why? Is that merely scale? Secondly, we heard evidence from other people that the investment community in the United States is more knowledgeable. Present company excepted, is that the case? Does the investment community in the US have more people who understand biosciences and biotechnology? How could the United Kingdom address that issue?

**Dr Hughes:** Certainly from the public equity perspective, when we see initial public offerings or follow-on offerings coming to market, which are additional capital raise after an IPO, they are generally, in the US, undertaken by specialist investors, whereas in the UK quite often we will see generalist investors—investors who invest across a broad number of sectors—investing. To your point, there is a difference in the level of investor understanding and sophistication with regards to specific life sciences offerings.

**Lord Fox:** In terms of the length of the time the parcel is being held, what drives that?

**Dr Bowler:** I would add to Mr Hughes's point that there is more dedicated healthcare money in the quoted US companies. I do not think they necessarily hold on for longer—some funds may do—but it is the depth of money and investors that will focus on different segments.

**Lord Fox:** There are more players in the game when it comes to passing it on to the next level.

**Dr Bowler:** I have come across US investors that just focus on early phase one to phase two programmes.

**Lord Fox:** There are a sufficient number of real specialists in order to give you the community with which to do this.

**Dr Bowler:** Yes.

**Dr Elder:** On your point about holding the parcel for longer, the BVCA—the British Private Equity and Venture Capital Association—has done detailed research into exactly that point. On average, the US funds on the venture end of the spectrum are larger and continue to hold and follow their companies through more rounds than their UK counterparts.

**Lord Fox:** Is the Patient Capital Review more likely to address these, frankly, than the Bell strategy?

**Dr Elder:** Yes, though just to make a point on that, the Patient Capital Review will need to have a specific life science chapter or strand to address the particular and unique issues of the life science sector compared to other sectors, which at the moment it is not set up to do, but as a next step, to pull the two pieces together, there needs to be that common joint approach.

**The Chairman:** What part would the health sector have to play in that?

**Dr Elder:** Do you mean the NHS?

**The Chairman:** Yes, in the Patient Capital Review.

**Dr Elder:** In a life science-focused Patient Capital Review chapter, if you like, the NHS would play a very central part. The John Bell report does a good job of pulling out some of the unique opportunities that the UK has to use for that, underpinning a greater degree of investment in the sector.

Q128 **Baroness Neville-Jones:** I want to ask you briefly about Germany. Both funding mechanisms and corporate structures are different in the Rhineland model. Are there things we could learn, particularly in that pass-the-parcel structure that you have just described—for instance, discouraging companies from coming to market when it is a bit premature? Are there habits and cultures that could be inculcated from elsewhere? The US has both expertise and scale. We do not have enough of either of those. Can we take anything from any other culture and indigenise it in this area?

**Dr Hammond:** I cannot comment geographically on Germany, but an interesting example is what has happened with SEIS at the very earliest stage. That has hugely expanded what can be done in terms of the tech-based businesses. That does not translate across to life sciences or hybrid science-based businesses.

**Lord Fox:** What is SEIS?

**Baroness Neville-Jones:** Why?

**Dr Hammond:** SEIS is the tax incentive scheme. Why? Because the average angel can understand a mortgage company, another fintech service or real estate. They do not have the expertise on a specific life science sector. So they just avoid that altogether. A way of equipping those people would be to wrap some expertise around them, that would possibly free up a lot of capital.

**Lord Griffiths of Fforestfach:** You mentioned that in America the investors are better informed technically. I wondered, from your own experience, as you are all investors here, if you took a typical investor in the UK and a typical investor in the US, would it be that in the US they had maybe specialised in science, done a PhD in science and were scientists who had moved into it, much as Dr Elder moved from being a surgeon into investing with a lot of knowledge there? By contrast in the UK, we are more like GPs. We know a little about science. Is that unfair?

**Dr Hughes:** It is a reasonably fair comment. To clarify, are you talking specifically about investors as in investors in life science companies here?

**Lord Griffiths of Fforestfach:** Absolutely, yes.

**Dr Hughes:** What you end up with is that you have dedicated investment firms that are specifically about life sciences investment. They bring together a whole group of investors who are specialist and will have specialist backgrounds, whereas in the UK it may be that you have a very general investment firm that maybe has a small pocket that invests specifically in life sciences.

**Lord Griffiths of Fforestfach:** That is where scale would help, because if the market was larger you could set up a specialist firm. If the market is more limited it is hard to see where the return is coming from.

**Dr Hughes:** Absolutely, but one should not forget that capital markets are increasingly globalised and the pool of investors can be grown by attracting international investors to invest in the UK markets, as a way of increasing the pool of potential specialist investors.

**Dr Bowler:** There are investors in the US that specialise in very narrow subsectors within healthcare. Within biotech there are different technologies or disease areas you can think about, but across life sciences there are various other industries like the companies that produce the analytical tools that are used in laboratories to some of the health service companies. You have investors and analysts that just focus on that, whereas I have help from colleagues who are based locally in the US, Japan or wherever, but I am effectively, as you describe, a generalist.

**Lord Griffiths of Fforestfach:** I was not meaning to criticise you in that.

**Dr Bowler:** It is a very fair description.

**Dr Elder:** There is a virtuous cycle here. It is largely driven by the weight of capital and, where there is demand for that type of investment, the expertise will come. There are plenty of PhDs who can be attracted into the City to become analysts. Back in the 1990s, there were quite a few. Those numbers have dwindled since, largely as a result of the flight of capital rather than as an effect of that expertise going. Creating the expertise will not necessarily bring the capital. Bringing the capital and expertise at the same time would be required.

Q129 **Lord Vallance of Tummel:** Most of the discussion over the last several minutes has been about the question I was going to ask, which is about the engagement of the investor community. Let us stand back from it a bit. We have an excellent science base here in the UK. They may not be motivated in the way that perhaps Dr Hammond would wish to translate science into economic output. We have one of the largest and deepest financial markets in the world in London, yet somehow we are not managing to bridge the two to get real economic impact out of these two key ingredients.

There is a gap in the middle, as I think an earlier witness said. We are going to have to wait for the Patient Capital Review to see what comes out of that, but I suspect something is partly cultural. It is the nature of the risk appetite of the financial markets and the unwillingness to take really big risks over a long period of time. I think an earlier witness mentioned "gung-ho" capital in the US. We do not have gung-ho capital in the UK and perhaps we need gung-ho capital.

If you look at the objectives of John Bell's strategy, it is to create four UK companies valued at more than £20 billion market cap each in the next

10 years—in other words, we are talking about £100 billion—and to attract 10 large and 10 smaller life science manufacturing facilities in the next five years, which must be the best part of £2 billion. Is this cloud-cuckoo, or is it achievable given the ingredients that we have? What is the role of the state in this? There is a market failure here, quite clearly. How does the state intervene to bridge the gap between the brilliant science base, universities that are perhaps not well motivated, and the financial markets to produce something that is really good for the UK?

**Dr Elder:** The state has a role to play where there is market failure. We have discussed some of the reasons for market failure from a financial perspective but there are others, including regulatory, as well. Typically where there is market failure, creating incentives to incentivise money to plug a gap that naturally it would not plug is a role where the state can play a strong part. Increasing the likelihood of the financial capital to come into that gap and easing any regulatory hurdles that that capital might face getting into that gap are two clear ways that the state can intervene and would probably need to intervene. There are a lot of regulatory issues coming up in the near future that can be addressed. The Patient Capital Review will start to look at some of those incentives, I hope, that can be looked at from both public markets coming in to earlier stage and pools of private market capital becoming deeper.

**Dr Hughes:** The intention to attract a certain number of manufacturers to the UK is an area where state intervention has typically been very effective. I can think of a number of conversations I have had with company management where I ask why they have decided to locate their manufacturing in a particular location, and it has been because they have been incentivised to do so. From the perspective of being able to build companies with specific valuations, there is a certain serendipity to where that company will be located when it has that valuation, if you see what I mean. It has to be the right place and the right time with the investor appetite to be rewarded with that valuation. Life science is a very sentiment-driven sector in public equities and can be out of favour and lowly valued. To have the potential to be worth that kind of valuation is absolutely possible. It is a case of making sure that, as we have already mentioned, these conveyor belts move smoothly and companies are able to grow and receive capital as and when they need it.

**Dr Bowler:** Looking at history, that would be a stretch target, clearly. The report clearly outlines the need for patient capital and highlights the examples of two companies, Adaptimmune and Immunocore, which were allowed to mature to a later stage. Adaptimmune has raised money in NASDAQ rather than the UK, but as a result it is a better-funded and better-recognised company than it might otherwise have been. It is about the means to develop and nurture that patient capital, to give companies time to develop, because if a company gets to the market too early and does have some very attractive assets, it may not last that 10 years. If a US company or whoever makes an offer, as a fund manager it would be my responsibility. If the valuation is very attractive, I would be obliged to sell my shares.



**Lord Vallance of Tummel:** Dr Hammond, what about the motivation of universities, which you touched on?

**Dr Hammond:** I really like your “gung-ho” phrase. That is the key problem. There needs to be a space where you can try really ambitious stuff and it is okay to go into that environment, to sit between the commercial and academic world. You have a very commercially orientated environment but you can easily draw back into academia, and critically switch between the two interchangeably. The biggest concern we see is that if I do anything commercial, I am then out of academia and that is that. That puts most people off. It is about being able to have that interface where you could work for a company—Syngenta, for example—then go back into academia for a little bit, then go to a start-up, and it benefits all of those partners in a long-term way while stimulating the capital at the beginning. It is small amounts of money that are needed. It’s £150,000 to £200,000 to try something, get some initial in-vitro or maybe in-vivo results, and see if it works. That is critical to increasing the top of the pipeline.

**Lord Vallance of Tummel:** Does the state have a role in encouraging this? Does the state have a role in matching funds, which would take some of the risk out?

**Dr Hammond:** I think it tries now but it could be more effective. The example given earlier of the European money where you have to have three different countries involved is ludicrously complicated for someone who says, “I have a good idea, I have a senior academic on my side, and I just want to give something a go”. There was an accelerator programme recently, which was a partnership between venture capital funds and Innovate UK. That was really encouraging. The challenge with it is that later stage venture capital funds, which are inherently fairly risk-averse, still want it to be quite de-risked before getting there. There is no space for, “I have a good idea. It is not stupid. I will work with a solid academic and industry to work it up, but I want to try something ambitious”. The only way that stuff moves forward is when you have a rich family to move it forward, which is really unfortunate. That is the gap we need to fill.

**Lord Vallance of Tummel:** I could spend all day, Chairman, but I think we have to wait for the Patient Capital Review.

Q130 **Lord Borwick:** The UK is often good at producing start-up companies in the life sciences sector but problems often come with the scale-up and growing those companies. Why do you think this is and what can be done to improve the situation? A further point is that in his report Sir John Bell talks about the ambition of producing several multi-billion-pound enterprises. Do you think that is realistic and achievable, or do you think we would be better to concentrate on several hundred multi-million-pound enterprises?

**The Chairman:** In your response, it did feel like the four £10 billion companies was ambitious. The question now is about smaller companies.

**Lord Borwick:** Would we be better with something else?

**Dr Hammond:** I do not think it is unreasonable. The challenge that we have is that when companies go out for that first bit of fundraising, they are told to basically tone it down, do something near-term, get revenue in earlier, make a decision on the end and make something that will appeal to the next people to pass the hot potato along. If we can back stuff that could be really ambitious and own a sector, we can do it.

**Dr Bowler:** It is good to have ambition, because you are going to set the infrastructure and tools to help facilitate that. Whether you get to the four companies with a £5 billion market cap, let us wait and see. Presumably, along the way, you would generate a number of smaller companies. That would presumably be a positive as well. If you do not focus on just four big companies but create the framework to allow companies to flourish, that would be deemed a success, if maybe not quite to those precise criteria.

**Dr Hughes:** Absolutely. The more companies you have, the more probability you have of producing one of those large companies. To Dr Hammond's point, there is an overemphasis on near-term profitability. That should be the ultimate aim; they are capitalist enterprises. However, there is a very different mind-set in the US of maximising the value of the assets and reaching their full potential. I have seen companies in the UK that have assets that are languishing because they are not being developed because the focus is on near-term profitability in an area of science in which, in the US, there are companies that I can think of with \$10 billion valuations. There is a need to get away from that thinking of purely focusing on the near-term profitability as the end goal of these businesses.

**Baroness Neville-Jones:** How does the financial community contribute to that? It is not just everybody else's responsibility.

**Dr Hughes:** I am highlighting that those are the pressures from investors in the UK.

**Baroness Neville-Jones:** A relationship between fund manager and investor. Is there nothing to be done in the dialogue about investing?

**Dr Hughes:** There is absolutely plenty to be done. We engage very actively with the management of the companies in which we invest. We think it is very important to do so. Our attitude within the biotech fund is that we want to maximise the value of those assets because that is what produces the best return for our unit-holders. We hold that opinion. I cannot control the opinion of the majority of investors in the market, but I would certainly be a proponent of our thinking rather than the shorter-term thinking.

**Baroness Neville-Jones:** I entirely understand you cannot control it but it does seem to me that there are moods and attitudes inside investor communities. How are these brought about? It should be possible to change the culture.

**Dr Hughes:** Absolutely. It might just take a very long time to do so.

**Baroness Neville-Jones:** Really?

**Dr Hughes:** Humans are obviously habit-forming and it is difficult to break those habits over time. You can change that mind-set. If there is some sort of intervention the state can do that encourages the longer-term horizon and disincentivises necessarily seeking earlier profit, that might be a way to do it.

**Dr Elder:** The issue you are describing is a cultural one. In order to shift cultural thinking without it taking a very long time, typically incentives are required to make that shift. That is where financial incentives can make a big difference to how people view risk.

**Baroness Neville-Jones:** Such as tax relief?

**Dr Elder:** The Patient Capital Review will deal with this, but on the retail side absolutely there is a whole range of different types of tax relief, and also on the institutional side, whether it is through tax reliefs or other routes of incentivisation, we need to encourage institutions to invest earlier and in sectors they would not otherwise invest in, such as life sciences. There are ways of making it financially more acceptable, whether it is the actuarial people who look at large fund allocations; that financial incentive will make it much more attractive for them to allocate funds there. My colleagues are more attuned on that one.

**Lord Vallance of Tummel:** Would remuneration packages for fund managers make a difference? I am told that at the moment they tend to be fairly short-term.

**Dr Elder:** Certainly not on our end (ie venture capital). It would not make any difference.

**Dr Bowler:** Having spoken to some of my colleagues who specialise in general small companies, they will just point to the UK track record and say that the risk-reward does not favour investing in this space. The history suggests not to do it. That is an attitude that has been built up over numerous years, and it will take time to change that. It then is a requirement to have companies of a more developed stage coming to market—ie better-quality companies, which will have had more time to mature and properly commercialise and develop their inventions.

**Lord Griffiths of Fforestfach:** We say it is a cultural issue. You are, after all, investors but you are investing other people's money. Pension funds and insurance companies looking to invest in you have people they are accountable to. I do not know the evidence for this, but from everything that has been said it seems to me that in the US it is a question of scale. Because the scale is that much larger, you have more people, more wealthy families and more individuals who are comfortable and therefore can put money into a higher risk investment than we have in the UK. Maybe tax policy could help that. As we have a global market, if you were to invite government officials to come in and help direct you, that does not seem to me to be the real answer in this space.

**Dr Elder:** It is being able to get access to larger pools of capital. We invest the capital that our investors give us to invest and if they have a particular risk appetite or investment amount, that is what we deal with. It is creating the incentives for that fundamental level to change, where

people are more willing to take that risk step or to invest more money into the various funds that we then invest.

**Lord Griffiths of Fforestfach:** Could we in some way merge with the American market, so that capital was so fluid and we could tap the American market much more than we are doing at present?

**Dr Hughes:** We see some companies doing that, pursuing dual listings in the UK and the US. That is something that companies could make greater use of, yes.

**Lord Fox:** That is presumably quite hard work, listing in more than one place.

**Dr Hughes:** It is, and obviously it comes with a certain level of expense and needs a specific expertise.

Q131 **Lord Mair:** I want to come back to what we had discussed earlier. My question is for you, Dr Hammond. You refer in your written evidence to a bizarre dance between universities and industry. What can we do about this bizarre dance? My question is around the culture that exists in academic institutions, how that can be improved and where it sits in relation to IP. Tell us what you think should be done to make that bizarre dance go away.

**Dr Hammond:** It is a big question but I will try. I do not think it is an IP issue, to be clear; it is just odd incentives. When a company comes in and sees a project at university, there are just different time horizons. The university will put a PhD or post-doc on it as a two or three-year project. In some cases it might go back into the company but really what they are after is recruiting the PhD or post-doc afterwards. You only have so many of these per group. They are typically £100,000 per year. The company sponsors maybe two or three PhD students in a group. That is a really slow way of doing it. What would be a much better way of doing it is really understanding what the opportunities are in the world. This is not necessarily going to come from really big companies. We have found it really hard to find people who can articulate what the actual opportunities are.

For example, with self-driving cars at the moment, is LIDAR good enough? If not, what can we do about LIDAR to make it better? Get those opportunities out into the open, so that the really ambitious PhDs and post-docs can drive that opportunity while bringing in the academic expertise around them. That might be within the university, it might be a licence or it might be outside. The way that you do it does not really matter; it is being able to give sight of the potential opportunities. That is what works in MIT, Stanford and the Boston cluster. A VC will walk into a professor's office and have a conversation, just an open conversation, about what they can do in this area. A PhD student will walk into a VC's office and have the same kind of thing. That does not happen here and that is what we are trying to fix.

**Lord Mair:** Do you think our PhD students and our post-docs in the UK

are less inclined to do this kind of thing, or would they do it if they had the opportunity?

**Dr Hammond:** It is just culture. That is what we have shown. We open it up and get nearly 700 applications every six months from people who want to do this. If you have done a PhD, you have spent three or four years looking into something. You want to apply it to the world. That is what you are really driven by, but then you come out and have no idea how to do that. That was what I went through as well, which is why we set it up.

**Lord Mair:** What do universities need to do to improve the situation?

**Dr Hammond:** I do not think there is a big change to come from universities. It is about creating something outside that allows that free flow in and out of universities and that makes the opportunities clear.

**Lord Mair:** When you talk about free flow in and out of universities, what do you mean by that?

**Dr Hammond:** Sure; that is probably not clear. I will give you a good example. One of our founders at the moment is looking at brain machine interfaces. This is for retinal implants: 40% of blindness cases can be fixed with an implant. The implant is incredibly low resolution. That is because when you stimulate cells, you stimulate lots of them at once, essentially. He has come up with a clever way of fixing that. This is a long-term project. What he has brought together is several academics, from Imperial, UCL and the Wyss Institute, and together they are applying for research body funding to push that project forward.

Without him having the time to think about what the real challenges are in that area and going out and talking to the companies that make devices in that area, he would never have done that. He would never have done that within the lab. He would have gone on to work for another company. It is just creating that time and space to think and then people can bring together the network. Everyone wins, essentially, then. Academia wins, you get new companies and the PhD wins.

**Baroness Morgan of Huyton:** I sort of understand what you are talking about, but where is that located? Are you talking about a brokerage? What space does this entity that you are talking about, which puts these relationships together and gives us space to think and to get the finance to do that, sit in?

**Dr Hammond:** You are right. It is not entirely clear where it should sit. We try to fill that gap at the moment, but it is what we call coalitions, which are public-private mixes. For example, we are just starting one with an oil and gas consortium, which is part Scottish Enterprise, part oil companies, part what we are doing and part universities, in one mix. It is an integrated picture.

**Dr Elder:** From our University College London fund and associated funds, we see there are a number of models now emerging that are more flexible to the investment in pre-commercial ideas and projects, leaving them within the infrastructure of the university, so they can flourish for

longer and go to a later stage before they become either subject to a licence to a big pharma or a spin-out into a biotech company as a more substantial later-stage asset. There is the Apollo Therapeutics Fund, for example that Imperial, UCL and Cambridge are involved with, with three corporate investors from big pharma as well, who have clubbed together in that consortium to say, "Let us look at projects, let us invest in them within the university, let us bring them to a later stage, and then we will all look at them and decide whether we want to license them". The UCL Technology Fund operates a similar model, which is unique and took us 10 years to raise because it was unique.

This is the cultural change we are facing. Convincing people to adopt these new approaches takes a long time because money has a certain risk attached to it and a certain timeframe. When we are saying to an investor that we are going to raise a 15 to 20-year fund to invest in a unique model that encourages a pre-commercial investment in IP, most people walk away. These sorts of models are emerging now, and John Bell touches on it in his report. A lot can be done for universities, corporate entities and investors to come together and create that space you are talking about, where you can enable a scientist to continue their project, surrounded by those investors, the university and the commercial organisation but without having to chuck the whole thing into a spin-out company and give up his job in the university.

**Q132 The Chairman:** Dr Hammond, you made two points that I thought were important. One was that our culture is different. If you have done a PhD or a post-graduate degree, you then want to take what you did as research in your PhD to try to innovate. In the United States, most of the doctors will do their undergraduate degree, qualify with an MD and then do a PhD. Here, most clinicians will do an undergrad degree and then a clinical MD. Therefore, that drives them to the clinical side, not the innovative side. We have heard in evidence before, when we went to the Crick Centre, about there being more training to be done at undergraduate medical degrees and PhDs, rather than in clinical MDs. Do you think that is a barrier? You gave an example of retinal implants where the person has to take time out.

**Dr Hammond:** I am not sure I can comment on the MD-or-not route, but in terms of training, it definitely helps. Most universities now have some sort of accelerator inside. They do not tend to generate amazingly big ventures, but they give people that chance to have a go at entrepreneurship a couple of times, which is important. The average is three times to go around the system, start something, make a little bit of money and maybe sell it or close it and move on to something else that goes onto become a more significant business. It is important to have that training, absolutely.

**Dr Elder:** That combination of PhD, entrepreneurial training and/or medical training is important, whichever dimension it is. I was involved in an MD-PhD programme many years ago. They have got more numerous and that is a good thing. On the entrepreneurial side, I have seen and have had as interns various PhDs who have built into their PhD an

entrepreneurial section, if you like, where they spend six months in industry or with an investor learning about that aspect of it. That is hugely positive. We get very good people as a result of it and they get good training. More of those sorts of things would be helpful. It is not going to be culturally ground-breaking but it is definitely helpful.

**Q133 Lord Fox:** The panel established that the financial community needs to be incentivised to change behaviour. We are looking for a big cultural change in academia, because somehow there is still a higher kudos for academic purity than there is for the technical application of that. That echoes the value that A-Levels have versus apprenticeships. It riddles the whole thing right through. Rather than doing it because they feel they have to and it is a way of getting money in order to fund their academic ambitions, how do you incentivise universities to take them there for its own sake?

**Dr Hammond:** My feeling is that this does not come top-down from the university. A university is a collection of academics. They look to the external market for that proof. This was the case in Silicon Valley before Genentech made it big; that changed mind-sets. We need more of these sorts of stories here. I was there for six or seven years. You started to see that when a few of those companies were exiting. The people surrounding those departments were then excited about that potential. It takes time. I am not sure you can force universities to do it.

**Lord Fox:** The question that I have been allocated, so to speak, is that one of the, if not the, USP that comes out of the Bell report is somehow activating the NHS into forming the basis of real industrial progress. Data obviously has something to do with that, but it is also the culture of the NHS as well. Do you honestly think that can be done?

**Dr Elder:** The opportunity is absolutely there, but it has to be grasped with both hands, not just by the people at the top, but the incentive structures have to be aligned so that people at ground level and all the levels in between are able to move fast too. Take, for example, the big data opportunity with artificial intelligence in imaging. There is a fantastic opportunity here to pool NHS images across the country. Companies around the world are doing this now. IBM is buying up data sets for billions of dollars.

**Lord Fox:** We understand the opportunity. Do we actually think it can be done?

**Dr Elder:** That is why I am using that as an example. Could the NHS pool all those images and create that opportunity? Absolutely, yes. From an interoperability perspective, yes. From a ground swell of people who think it would be a good idea, absolutely. Funding-wise, what would it cost? A few hundred million pounds. Yes, we could do that. There are no technical barriers to doing this. The issues are again going back to cultural issues and the ability to almost ram-road your way through obstacles. If the desire is big enough, now is the time to do it. If we do not get on and do it, there is no point doing it in five or 10 years' time down the road, because the investment will not be there then. Now is the

time to do it, certainly in data. I would urge that we find ways of making sure that people are allowed to take those risks at lower level and encourage people. For example, on images, should we have everyone signing up to allowing their images to be used in an amalgamated or aggregated way? Why not? Let us ask people: 75% to 80% of people will say yes.

**Lord Fox:** Does the Bell report provide any insight as to how that might actually be delivered?

**Dr Elder:** No, it does not. It indicates that that is an opportunity. It talks about hubs and so on.

**Lord Fox:** It does not indicate how to farm or rear that.

**Dr Elder:** Not at a detailed level, no. I was pleased to see that in the report. It needs to be taken to another level to ask, "What are the sources of funding? What are the bodies to put it all altogether? Who is going to champion it?" There is the opportunity for the state to take the shackles off various bodies from working together.

**Lord Fox:** Which bodies?

**Dr Elder:** The various NHS bodies: NHS England, the various hospital trusts, the commissions themselves, the patient advocacy groups, the privacy groups and the data groups. There are a whole range of different stakeholders who have particular viewpoints on whether information should be confidential or not or used or not for research. These are the sorts of things that we need to be brave with. We talk about gung-ho investment; we need a gung-ho attitude when it comes to the NHS, about taking the opportunity now. Let us be gung-ho about it because we will have lost the commercial opportunity in five or 10 years, when the rest of the world has moved on and we have not.

**Dr Hughes:** The NHS's strength is that we see real centres of excellence, particularly in areas of haemophilia and rare diseases, such as amyloidosis. That brings patients to very centralised locations. That is a real benefit for public companies when they are planning their clinical trials. They are able to recruit from sites in the UK potentially very rapidly. We have seen that in early stage gene therapy trials for haemophilia. There is one US company that I believe is doing its phase one and two solely in the UK. Amyloidosis would be another area where there has been great success. We have seen results for patients coming through just in the last few months in phase three clinical trials conducted here in the UK.

**Baroness Neville-Jones:** Would exploitation then take place in the UK, or is that then removed to the US? You have given an example of early-stage trials. What then happens to the exploitation of the knowledge gained? Does it go back to the US?

**Dr Hughes:** Certainly in terms of the results and the value of that asset, if it is a US company or any company from any other country, they own that product. Patients in the UK can benefit from that. It would at that point come down to the cost of the therapy.



**Baroness Neville-Jones:** We should be interested not only in well-being but also, it seems to me, in prosperity.

**Dr Bowler:** That idea can be developed further, in terms of having these centres of excellence. I have visited the Gustave Roussy cancer clinic on the outskirts of Paris a couple of times. It is the largest cancer clinical trial centre in Europe. It is a functioning hospital but it is also a point where all companies that are developing cancer drugs go to. There is a network effect of basic research. Clearly you have heard of it.

**Dr Hammond:** These things do not even need to be massive centres and physical presences. One of the problems we are trying to solve is what are called "never events". It is when people get the wrong arm chopped off, for example. To solve that, the NHS has essentially set up a board that can work out how to join up all the budget lines to make that make sense, because the problem we see with most digital healthcare businesses is the economics just do not make sense, because you save a bit here but the person that pays is over here. Those small panels that join that up are the way to make this happen.

Q134 **Baroness Neville-Jones:** I want to ask you the birthday question: what is the thing that you would most wish for in the future of the implementation of the life sciences strategy? You do not have to agree. I would be interested to know what you identify as being the single biggest thing that needs to happen in order to get effective implementation.

**Dr Elder:** You have probably heard from my enthusiasm for the NHS asset that my wish would be that everyone would pool their data, images and know-how within the NHS. Instead of pulling each other in different directions, all just go in the same direction and make use of one of the most valuable assets in life science in the UK.

**Baroness Morgan of Huyton:** Does that not take some incentivisation for the NHS to do that? Incentives need to go both ways.

**Dr Elder:** Absolutely. My birthday wish was that everyone could work together. Clearly that is a hypothetical wish. In the real world, because there are people pulling in different directions, how do you get them going in the same direction? You have to incentivise and remove barriers.

**Lord Vallance of Tummel:** Can you guarantee secrecy? That is a major barrier.

**Dr Elder:** Those are all technical issues that we are more than capable of overcoming. It needs to be high on the agenda, absolutely, but at the moment those sorts of questions are just impeding the flow. There is no point impeding the flow on objections that can be technically easily overcome and the risk managed. That is the other thing. You will never get rid of risks completely but the benefits so far outweigh the risks in this case. Provide an opt-out as well, if you want.

**Dr Hughes:** I would like to see some reporting requirements within the junior stock markets that encourage international investors to come in: greater transparency, stronger reporting requirements more in line with what you would see for the larger more established companies, and

simple capital structures for those companies. I am against the idea of having different share class structures with the founders holding the majority of voting rights, because that impedes our ability to hold management to account and could disincentivise investment in this area. Strengthen those requirements.

**Baroness Neville-Jones:** It is very helpful to have a funding recommendation.

**Dr Bowler:** One of the suggestions in the report that strikes me as making a lot of sense is changing some of the rules for pension funds, to allow an allocation to higher risk appetites. That would then need the creation of investment vehicles, and one of the suggestions is for a public/private partnership as one of ensuring stewardship without the state dictating as an effective way forward.

**Baroness Neville-Jones:** That is a very interesting idea.

**Dr Hammond:** I thought the report was excellent and I agreed with basically everything. There are two points I would add: first, that gung-ho mechanism we have discussed, so that people can try stuff early and be adventurous. The second is about more focus on convergence. Where we are really good in the UK and Europe—we still count as part of Europe—is that integration between, for example, the life sciences and digital. There is a lot of opportunity on those edges. Bringing those people together currently virtually does not happen. We need to have a lot more focus on that.

**The Chairman:** We have heard before that the way IP is handled in the United Kingdom compared to the USA, and who holds the IP, particularly with academic institutions holding on to a major percentage of IP, is an issue. Is it true or false? Is IP a real issue for investors?

**Dr Elder:** My experience is that there is some truth in that statement. For different institutions it will be truer than for others. The universities are getting better and more aware of it as an issue. It is also wrong to assume the US is a perfect nirvana of managing IP. Every institution there is also different. What the US has done is that it has pioneered the low equity route, whereby it is quite happy to give its IP away to inventors for a very low equity stake on the basis that you are better off having a small amount of lots of things than a large amount of very few non-valuable things. We are starting to see that sort of ethos come in over here, with the recognition that you have to be pretty streamlined in the way that you take ideas through that translation stage and not bind them down in deep negotiations, fighting over IP and equity.

**Lord Fox:** Is that different position, in terms of how much equity you take, driven slightly by the nature of public-funded education in the UK versus how education is funded on a broader base in the US?

**Dr Elder:** It is a good point. I do not know. I have not reflected on that but it is very possible, because there is a different approach to it.

**The Chairman:** Gentlemen, thank you very much indeed. You have been most helpful. We very much appreciate you coming.