



Northern Ireland
Assembly

Committee for Employment and Learning

OFFICIAL REPORT (Hansard)

Promoting Innovation and Emerging
Technologies

19 September 2012

NORTHERN IRELAND ASSEMBLY

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Members present for all or part of the proceedings:

Mr Basil McCrea (Chairperson)
Mr Thomas Buchanan (Deputy Chairperson)
Mr Phil Flanagan
Mr Chris Lyttle
Mr Fra McCann
Mr Barry McElduff
Mr Pat Ramsey
Mr Alastair Ross

Witnesses:

Professor Suzi Jarvis	Innovation Academy
Dr Tom Mason	Armagh Planetarium
Dr Charles Wessner	

The Chairperson: I invite Professor Suzi Jarvis to join us at the table. Some members may remember that Professor Jarvis was in front of the Committee before. She is a professor at University College Dublin (UCD) and is the director of the Innovation Academy in Dublin. She is doing a lot of work for the Irish Government about how you use innovation for creating jobs for entrepreneurial business. I just thought that she should come up here because she is particularly helpful with bringing over Dr Charles Wessner, who I will now invite to address us. Charles has been doing tours of a number of our universities. Charles, you are more than welcome. Dr Wessner is the director of technology, innovation and entrepreneurship at the National Academies in Washington DC. He has been talking to the University of Ulster and Queen's University. He has been looking at the composite centre, the science park and a number of other issues. After this talk, he will be going to talk to some of the leading higher education facilities in Dublin, including UCD, Trinity and, I think, Dublin City University (DCU). What Charles has to say about who has influence and about some of the lessons from across the way is really quite interesting. So far, I have heard some very challenging but positive things. Charles, are you going to speak from here or from the podium?

Dr Charles Wessner: If you do not mind, I would prefer the podium, but that depends on —

The Chairperson: No. If you go to the podium, we will put your presentation up on the screen. Charles, when you take your place at the podium, you can introduce yourself and tell us what you are going to talk about. I think that you will find this quite interesting. Some of the Committee have had the opportunity to hear a little bit from Dr Wessner, and I think that you will find this interesting. I have already told Charles how many contacts you have, and he also has a lot of contacts. I think that it is good to do that.

Dr Wessner: I would like to thank you, Mr Chairman, for the opportunity to speak to your Committee. I would also like to thank the Committee for taking its valuable time to hear a message from across the pond. I have had a very stimulating visit here, and I am very much in your debt. When I came here, I thought — you will see this from my talk — that you have to build up some more assets. I will now shift to talk about how you are going to use the assets you have. It has been quite impressive to visit the University of Ulster, Queen's University and the science park, which is outstanding. The National Academy of Sciences (NAS) is cutting edge in respect of policy in Europe and the US. I would like to emphasise that, although I come from the National Academy of Sciences, I will be speaking to you in a personal capacity. I will speak directly to you, because one of the things I have learned is that a certain amount of candour in life is a good thing, partly because it is short. There is a global innovation imperative, and it is very important that you recognise that. You have a major challenge here that is, I think, deeper and starker, as I said to some of your colleagues at dinner the other night. That is because you have a good life and a high standard of living. You have a high standard of living because your grandfathers and fathers invested and worked hard to earn things on their own. The prosperity you have is enjoyable, but that prosperity and the relative position of your children and grandchildren in the world will depend crucially on what you do over the next decade.

I was privileged — I hope that you will not see this amiss here — to have been honoured by the French Government last Friday evening. While speaking about me on behalf of the French President, the Ambassador of France said that the French Government have three priorities right now: innovation, innovation and innovation. I think that it was kind of unusual for that to come from our French friends, but it is because they get that last point about the fact that innovation policy — I want to stress this to the Committee, given your responsibilities and remit — is not some kind of cute afterthought when you have done everything else. That is how you will get employment and where your growth will come from. Trust me, if you do not work at it, there are plenty of others who will take that burden from you, and they will be very happy to do so. I was delighted to hear from Tom that you are going to get into missile production. OK, good. So you want to do missiles and aerospace. We have the saying from Mr Reynolds of the State Department, who knows your Chairman, that you want to go out and play with the big animals in the tall grass. When you are competing in the aerospace sector, you are definitely playing with some very large animals. Some of these animals, as their name suggests, do not play by the rules. If you think that the Chinese, the Brazilians or the Indians are intent on leaving you space in aerospace, think again. Many of these countries are focusing on growth, and they are also focusing on national strength. You will notice that I did not mention consumer welfare. They are trying to grow their economies to give them a stronger place in the world. They are supporting their universities massively. There is some good news for you and for us. Funding for research and support for universities is a global good. It creates opportunities for co-operation, and one of the things that we have to wrestle over with our policymakers at home at times is this yin and yang in that there are people who may be trying to knock us out of the ballpark on Monday who we need to co-operate with on disease control on Tuesday. That is the world that we live in today. You also have the strength that your universities are already good. They already have proud traditions.

You also need support for innovative small business, and, to be frank, based on a cursory view of just a few days, if there were one thing that I would say to you that you are not doing enough of, it would be support for small business. Why do you want to support small business? You want to support small business because that is where the jobs come from.

Two of the challenges that you have are growing innovative firms and building collaborative structures. I have been very impressed with what you have under way, but you need to do more and harder. The good news is that, with the political devolution that you have, you have opportunities to do things that you did not have before. You are fortunate to be on a Committee that has options and can have an impact on policy. Your universities, which I just mentioned, are not only very strong but are very well connected to the Irish economy and internationally. They need to do more.

I stress that I am bringing you a view from the United States. I am unapologetic about the strengths of the United States economy, and I am also quite critical of some of our failings. Those of you who heard me speak earlier will understand that. I am here today to talk to you about a proven recipe for success. Let me stress something. Any of you who ever cook will understand that having the recipe is an important first step but is not an assurance of quality. You need to create positive conditions, which I will talk about in a minute, and create focused, well-funded partnerships, funded by a patient Government. One of the things that I have heard everyone say is that you need to work at breaking out of this audit culture. Given the culture that you have in some of your bureaucracies, I get the impression that when they watch a soccer game, they spend an hour afterwards dissecting why the guy missed the goal, whether he was playing properly and how he really should have kicked the ball.

The goal is to keep taking shots on goal, not to try to explain endlessly why he missed the shot. There is a lot going on, and there is a lot going on in the innovation space. You also need 21st century universities and new institutions such as the science park that you have. All that is needed to support.

I will talk about one of the key things that I have noticed in the past few days that I think you need to work on a bit more. Arguably, you have open markets to competition. That is important because that is where the new companies go and that is where they begin to produce. However, you also need to have gentle bankruptcy laws, and I would like you to recommend to the Parliament a deal that the time that an entrepreneur has to stay out of circulation after he has gone bankrupt should be matched by the time you have not to stand for office if you run and lose. If the entrepreneur has to be out for 10 years, you have to wait 10 years before you can try again after you lose an election. Is that fair enough or would it be stupid? I think that it would be stupid for you, and it is certainly stupid for the entrepreneurs. There is absolutely no reason to do that. One of the things that I really like about coming to Europe, and particularly Brussels, is that they talk about doing what they do in Silicon Valley, and they are really enthused about that. They want to do just like we do, but they do not want their universities to be too commercially orientated, but they do not want to let their entrepreneurs go bankrupt and then try again, but — you get the idea? They want a winning team as long as they do not have to practice hard. That is not how we do it. Those conditions are really important.

Fortunately, you do not have a problem with intellectual property, and you want to make sure that your tax regime lets people make some money. Small companies are key players. They are really more important than anyone can imagine. They create four out of five new jobs in the US. Over time, they also create the really large companies. I like putting this up. You know, on a generational basis, you had Intel in 1968, Microsoft in, I think, 1975 and Google in 1998. You talk to young people today, and they do not imagine — in fact, this is a true story: in the mid-1990s, my son was beginning high school, and I told him to go downstairs to get an encyclopaedia. He looked at me as if I were insane and went to Encarta on the internet. He then looked at me and said, "Dad, didn't you use the internet when you were in high school?" It was really hard to explain to him that we had only had the internet for two years. That type of environment that we are in is just transformative, and it comes from academic award from the National Science Foundation to two young scholars in Stanford University, who then took the opportunity to leave school. They did so with great hesitation, but they were encouraged by their dean to go out and take a try. He told them that if it did not work out, they could come back and take up where they left off. Can you do that in your schools here? Can you leave a doctoral programme and come back? Can the professors actively take an entrepreneurial lead? I hear that they are allowed, but you have to be aware of one of the problems that we have. We have what you call a senior executive service, where you get more money, but have to accept no career guarantee and can be assigned anywhere. It does not work. Why? Because it is administered by a bunch of civil servants, who just do not have that mindset. You know what we do if we have a senior executive who does not do the job right? We hire another one, leave the same one in place, put more people in and have a parallel organisation that tries to do what he is not doing. That might not be what you expect from the US. It is not what we expect, but it is what they do.

This is something that you have to be careful of. Economists bring a lot of analytical strength, but they also bring some very baneful ideas. One is that the market is perfect and that if it is a good idea, the market will fund it. Leading economists and venture investors will point out that actually it is very hard to figure out. You know my example of Google? They went all over Silicon Valley trying to raise money for that company. No one wanted to give them any money; it was just another search engine. Those companies deeply regret that now, but they have less than perfect information about innovative new ideas. Nobel prize winners whom we have worked closely with, such as Mike Spence and Joe Stiglitz, call that "asymmetric information", and it leads to suboptimal investments. This is a simpler version of that. In the US, we fund new ideas with about \$150 billion a year. By the way, that is a good reason to co-operate with us. Overall, we spend about \$415 billion, which is larger than Germany, France, Japan and China combined. We spend a lot. You need to get capital to get across the "valley of death", as the venture capitalists call it. It has nothing to do with whether the ideas are good, but everything to do with whether you have the management team and the capital you need to get across and take an innovative product and begin to develop and grow. Many people say — and this is what I call the great European excuse — oh, you have venture capital and we do not. Well, why do you not? Oh, well, we actually passed a lot of laws and regulations to make it really hard to be a venture capitalist in Europe, that is why. But this is part of our deal: we want to imitate you as long as we do not have to do anything like you.

Besides, these guys make money, and we want to tax all that money away, because as President Hollande says, "That is wrong. You don't want people creating new jobs — I mean, new companies — I mean, making money." But they do that by creating companies and jobs.

The venture capitalists themselves, though, are limited. As I just mentioned, they also suffer from limited information on new firms. They are also prone to fashion: one year, everybody wants to do biotech; the next, everybody wants to do nanotech; the next, it is all solar. I am describing actual fashions that have gone through Silicon Valley. Now you can do social media or social media — that is the space that you have to be in. Moreover, they have lost a lot of money. So they have moved downstream, away from the cutting-edge technologies. As one experienced venture capitalist told me, the problem with cutting-edge technologies is that that is also where the bleeding edge is. It is a tough business to be in.

However, and this is important, only about \$1 billion — or 400 deals — were invested in in 2011. That is down 40%. So, the venture investors are actually moving away from the upstream, early-stage finance that is so critical. As you can see, there is about \$28 billion; it is the largest venture market in the world, and it is really important. However, the amount of seed funding is actually quite small. So, you are getting a contraction there. You are getting the first money, and, as any of you who invest probably know, the first money is the hardest money.

It is also worth pointing out that being able to fund female entrepreneurs is important. Why is that? It is not because it is politically correct. I was personally distressed by an article that led me to understand that the EU is trying to decide what percentage of women you should have in boards across Europe. I am happy to learn that Finland, Sweden, Greece, Italy and Ireland are all the same and should have the same percentage; that is a good thing to learn. We in the US do not think so, but we do understand that women are the other half of the economy, and that countries such as Japan, which want to play with just one arm, are making a serious competitive mistake.

We have a programme called the small business innovation research programme, or SBIR. It is, basically, money that is used to jump-start innovation. It is a very competitive programme, and I want to emphasise that. It is not a programme that is designed to help small companies because they are small or because they are nice guys. It is tough. It is tough to get in, but it has been there for 25 years and it has two phases; one to provide proof of principle and the second to develop prototypes.

This is how it works. As I mentioned, we spend a lot of money on research, but we also have a lot of pressing government and social needs. Some are mission needs, which I will come back to. Some are simple questions, such as the river is polluted. So, what is it polluted with? How much of it is there and what should we do about it? In each of those cases, you could ask small companies whether they could figure that out. You get a series of responses; you take maybe two out of every 10, and you give them \$100,000 to \$150,000 to do a phase 1 feasibility study. If that does not work but they do a good job — as we say, a near miss — you may give them another phase 1. It is not always linear. Only about half of those who are successful in phase 1 get to phase 2, where, today, they can get \$1 million. Sometimes, in the medical space, it is even more.

One of the things that is not part of the programme, but happens, is that the private sector then invests. We did not anticipate that when we set up the programme. Why? Because this is due diligence here: you have gone through two phases and you have also got over \$1 million in non-dilutive equity. What a nice thing. In other cases, where the Defense Department wants to buy something, they put in non-SBIR government funds to push it forward.

We would like to talk about phase 3, but actually there is no phase 3; it is what happens afterwards. Something that separates this programme from many of the EU programmes is that there is no recoupment. There are two groups in the United States and in Europe that think that recoupment is absolutely important: lawyers and accountants. Both think that recoupment is great because you can then spend all your time trying to figure out exactly what is owed. However, as one Silicon Valley entrepreneur who had a very successful company said to me, "Look, if you are going to take money back from me if I tell you that I am successful, trust me, the research effort will not be successful." If you have an accountant who is accomplished in physics, he can maybe debate with me about whether that actually worked.

Incidentally, you will be familiar with the rover on Mars, which has direct relevance to here. A number of the instruments on Mars were developed by this programme. We do not expect major commercial success because we do not think that rovers will go into mass production. When you have a problem — how can you detect water on the planet of Mars with something that is very light? — then this is the programme that we turn to. When the Hubble telescope was broken and out of focus, those companies, not the primes, figured out how to fix it.

There is also an important question that we like to ask: compared to what? In the US, if you do not use these small companies to solve those problems, we go to General Dynamics, Boeing or Lockheed Martin. The joke is — it is also true — that they will charge \$20 million but still give only \$1 million to a small company that solves the problem, and the \$19 million is for overheads. What else are you going to do if you do not use something like this? These are some of the best-practice features. It is focused on that valley of death where that first money is so hard to get. It is a portfolio effect, and that is really important. We take multiple shots on goal. We do not know which one is going to succeed, and we do that because we do not know how to do it better.

There is no budget for this programme — I thought that that might attract your attention. No new money? You take this out of the existing Ministries' budgets and make a small allocation. They retain control, and they give the awards for their mission, but they have to give it to a small company. You may need a better syringe that can protect nurses from AIDS or hepatitis, that covers that needle point. Maybe better bandaging that clips easier and faster, or a better system for identifying breast cancer. Those are real cases. The basic problem is that you have an oligopoly supply for all your Ministries. I do not know that for a fact, but I am willing to bet a couple of beers with anyone here that they are supplied by an oligopoly. You get established relationships that go over and over and are not competitive.

Twenty to twenty-five per cent of companies that participate are founded because of the award. That is, they are pulling ideas out of the university and into the market. The research from those firms is top quality; about half have publications and about 35% get patents. There is significant growth from existing companies. That is another point that is worth keeping in mind. There is not only a venture capital fixation but sometimes a fixation on start-ups. The existing portfolio of companies that you have here needs to be reinforced and helped to move into new product lines. I want to emphasise that this is basically market-oriented. It provides, as I said a moment ago, new options for public procurement, brings new technologies to bear and creates price pressure, all of which is very hard to get in public procurement.

I will say a quick word about your universities. One of the things that a 21st century university does is drive growth in a region and, therefore, tax revenue. It is a source of new ideas, new companies and new employment. The contract research that professors can do is vital to revitalising and helping existing companies to grow. I cannot overemphasise the importance of that for regional branding.

One other observation that I have made in the past couple of days is that you seem to keep your candle under a pot. You need to do much more to publicise what you have and what you can do, and one way to do that is to reach across the water. You have an outstanding park in the Titanic area, but you need to reinforce that. You need more funding in that. I am not being paid by these guys to say that. You want more incubators, you want research institutions and small companies working in a common area. You have already started that, but it needs to be reinforced.

To conclude, you need to do what you are doing and do it harder, reinforce success, and provide these 21st century universities with the funding that they need. Can you generate interest by foundations? Can you create a legal framework that encourages private contributions? Have any of you guys ever been to the Massachusetts Institute of Technology? When you go there, you see all these fabulous buildings, but they are not built by the Government; they are built by private individuals who contribute to their school. Why do they do that? I like to joke that there are two reasons for that. Men like to be remembered, and you get to a certain point in life and realise that you are actually not as immortal as you thought when you were 25. Therefore, one way to be remembered is through your children. However, as a friend of mine joked, that does not always work out as well as you might like. The other option is to put up a building. Do people do that just because we are more generous in the US than they are in, say, France? No, we have a different tax code. We are encouraged through the tax code to make those contributions, and we are encouraged through our culture that it is a good thing.

If you go to Stanford University, which is not a poor university, you will see the Gordon and Betty Moore centre for this, for that; you look at the Keck telescope, where Gordon Moore has put in \$120 million, which is a huge amount. The Keck telescope, on top of Hawaii, is called the Keck telescope because it was put up there with private funds. The Government helped, but could not bring the money to bear. It is a fantastic place, by the way, and I had the privilege of visiting the Keck centre. The only bad news is that it is at 14,500 ft, which is a long way up. It was very interesting, but it became harder to listen to the talk as your head was cracking and hurting. They showed us where the oxygen was in case anyone passed out and fell over. However, they are two absolutely amazing telescopes that have a view of the sky that is unparalleled.

In any case, you have this good start here, and one of the things that I want to emphasise is that there is an open door to greater co-operation between Northern Ireland and the United States. You are trusted suppliers in the defence realm. We are setting up an innovation forum. Why would the US, with one of the best innovation systems in the world, set up an innovation forum at the academies? Why is there so much interest in innovation in the Obama Administration? It is because we know that we need to work harder to compete successfully in this world. We have a new report out that I would be happy to make available to you that talks about the things that we need to do. However, what I am emphasising to you is that we are in this together. We do not have any perfected cookbook. We have a book of recipes, some of which work and some of which need updated, and we would be very happy to collaborate with you in doing that. Thanks for your attention.

The Chairperson: There are a couple of issues that I want to bring to the Committee's attention. There is a lot of talk about innovation, small businesses and how we might do something, and the bits that I have taken out of this presentation are that there is a small business fund, which they go through twice, but it does not have red tape about it. How long does it take?

Dr Wessner: Six months.

The Chairperson: It takes six months to get in and get the money and away you go.

Dr Wessner: That is too long by the way, but we are working on that.

The Chairperson: So, it is in, out, and they fund a lot of young start-up companies, and they look after them, but it is not recoverable money. It is to give them money, and you either do or you do not. I think that there is something in that about how we look after our smaller companies that we need to think about. The second thing that came up — and, Charles, it did not quite come out in this particular presentation, but I would like you to say a word about it. You touched on it. It is a myth that the market will take care of itself. Everyone runs around with this bumper sticker that says that if the Government would only stay out of the way, we would all make a lot of money. The issue is that we all now live in economies where public intervention and public spending are important and that that has to be recognised for pump-priming in the early stages.

Dr Wessner: That is absolutely right. Sometimes, in a longer presentation, we point out that there is a very long history in the United States of the Government working very closely with the private sector. That is one of our good features, because we make public investments in platform technologies. In some cases, we make public investments very directly in private companies, as we have with the battery industry. We have given our battery companies hundreds of millions of dollars to get them going. I do not think that that policy will be crowned with success, because we only did it once whereas the Chinese and Koreans do it every year. I mean that. They have much deeper pockets.

However, that supportive role has been critical to development. It could be related to here. If you are doing satellite technology, jet engines, airframes, any of the medical devices that we have, or imaging technologies, the Government are involved up to their ears. Nuclear power is not something that was invented in a garage. There is a tendency in the US for certain parties to forget that.

In fact, let me tell a quick story. A guy left his walnut farm in southern California. He was frustrated with the Government. He just got his cheque for the production of walnuts and he is waiting for another cheque for the export of walnuts from the Department of Agriculture. He was concerned about the level of water he was getting, but he does not pay market rates for that. It is brought in by the federal government from the other side of the Rocky Mountains. He got on an interstate highway, paid for by the federal government, and drove up to the airport paid for by the federal government, where he boards his aircraft, which was developed through federal government payments to the military. He got on that jet turbine. There are no turbines turning in the United — do you want me to go on with this? *[Laughter.]*

The Chairperson: I think we get the general thrust — that the Government do. If you do not mind, there are a couple of quick questions that I want you to answer briefly before the members ask their questions.

Not everyone is familiar with the National Academies and how influential they are. You have made it clear that you are here to speak on a private basis, and that is understood. Just very briefly, could you just say how influential the National Academies are with regard to the Administration.

Dr Wessner: Thank you for the question. We are remarkably influential. I am quite unabashed about that. To the US Congress, we are the gold standard for objective non-partisan analysis. We provide direct input to the White House, both formally and informally. Right now I am working on some things that the White House is interested in. You know, basic stuff. We want to do more to support manufacturing. We understand that there is this thing called Fraunhofer in Germany. How does it work? How well does it work? Of course, one of our questions is always "What do you mean by work? What definitions or metrics are you using?" We do that.

The Chairperson: Do you also talk to Congress?

Dr Wessner: Both to Congress and to the executive. So it is a gold standard for objective, informed analysis.

The Chairperson: The second issue that I think would be of interest to people is the amount of research that goes on. Part of the problem is that most European people only go for the small agency. However, the big prize is in things like healthcare, given the size of that. Is there an open door for us to come through with you?

Dr Wessner: Yes. We spend about \$32 billion a year. By that, I do not mean the combined GDP of Hungary and the Czech Republic. I mean that this is just what we spend on research for the medical space. That is open to participation from people like you. I emphasise, with some humour, that the Americans like the Irish: you are welcome in the US, and you should exploit that more. You should send more of your people over, and you should invite more Americans here, because that type of interchange generates the possibility of co-operation. You also have assets, and you need to make sure that your universities have the funds to participate in that type of stuff. You know the Woody Allen joke that half of success in life is just showing up. Getting there and meeting and working with people is very much what counts.

The Chairperson: You attended the all-party group on science and technology's discussion on fracking. You kept quiet until the end of it, because everybody was having a go at America. Will you give a brief response on the energy situation? I do not mind you saying what your response was to being asked whether you were interested in whether Northern Ireland does fracking. Will you talk about the energy situation, the ethical issues, the decisions that we might have to make and what you thought of the discussion?

Dr Wessner: It was very interesting to see what you were able to do, Chairperson, and I compliment you sincerely on that: you brought scientists together with advocates of one position or another to have a reasoned and non-shouting discussion. He had to work at the non-shouting part. It was done in the best traditions of the National Academies, but in a political environment.

Frankly, I was kind of annoyed. I do not know whether you know this, but we have met the Kyoto targets. We did not sign the agreement, but we have massively reduced our greenhouse emissions. How did we do that? With shale gas and fracking. Instead of being delighted that we have met the Kyoto targets, while the EU, if you have not noticed, has moved heavily into coal and is not meeting its targets, we were reprimanded for having a completely uncontrolled investment in shale gas.

I am from Pittsburgh in western Pennsylvania, and I was surprised to learn that it is uninhabitable and that you cannot drink the water in that area. They tell me that there is one town that has water problems. That is wrong: there are many towns that have always had water problems, usually due to mining. If you apply the same standard to mining as the people at that meeting were applying to fracking, I recommend that you close your mining and nuclear industries immediately. Apparently, you cannot put up wind turbines because they hurt birds. So you ought to just quit and move to some other place.

That is where you raise a very important point, and Peter Styles was effective when he spoke about this. Look at a map showing where you get your gas. I used to do strategic studies at the Fletcher School of Law and Diplomacy. It comes from the other side of Russia. You are polluting the planet, because the gas leaks. You have a 12-day reservoir. The foolish French and the diligent Germans have 120-day reservoirs. You have a 12-day one. What if something goes wrong with the system? I would not begin to suggest that the Russians would turn off gas. They clearly would not do that this year. So I was appalled that some of the talk seemed to have nothing to do with comparisons. Can you take responsibility for yourselves? Can you use some of your own resources? Can you make

some money exporting it? Can you negotiate a deal to use some of the proceeds from shale gas to install more solar panels or wind turbines. In the US, I am known as being a big advocate for PV.

The Chairperson: What is PV?

Dr Wessner: Photovoltaics. I like supplies that come from the sky rather than Russia, because I know they will not be turned off. Let us not make little jokes about it being cloudy here, because the equipment works anyway. Germany does fine, and it is never sunny in Germany.

The last point was a bit of humour. One of the attendees wanted to know whether I wanted Northern Ireland to do fracking. I said that I did not give a frack whether you do or not. Do what you want.

The Chairperson: On the basis that we are pretty small.

Dr Wessner: Well, I am being very frank here, I hope not too frank. I get deeply concerned about the European attitude of, "We cannot do anything because it is not proven to be perfectly safe." You would not have had an industrial revolution with that attitude. We are happy when you are not at each other's throats, let alone everything being perfectly safe. There is nothing you can do that is perfectly safe, but I do resent people acting as if western Pennsylvania, where I am from, is some kind of wasteland. No; people are getting wealthy because they own the rights.

Your challenge for fracking here is you do not have enough rigs, you do not have the private sector push, because we own the subsoil, and you do not have the subsidies in place to encourage it. You also need to negotiate deals that make it attractive, for industry and yourselves. Can the Irish do that? Do you think an Irish businessman could do that? Sure. You could work out a good deal. You have a justified global reputation for doing that, so you ought to get on with it. I hope that is not too ambiguous. *[Laughter.]*

The Chairperson: I think we have got the general point, Charles. *[Laughter.]* That is pretty good. Phil, you were at the meeting as well. You know what it was like and it was interesting, but you also have other observations.

Mr Flanagan: Thanks, Charles, thanks for your very interesting presentation. It was refreshing to hear your thoughts, particularly that western Pennsylvania is not a wasteland, because I had been convinced of that. A substantial amount of scaremongering is going on about fracking, although I do not want to turn this meeting into a debate on fracking. There are other forums for that. You mentioned innovation, which is probably the buzzword doing the rounds. Are economic appraisals an American concept that managed to make its way over here or is it a European thing?

Dr Wessner: Economic appraisals of the impact of programmes?

Mr Flanagan: Just an economic appraisal. Is that an American thing that has made its way round the world?

Dr Wessner: Yes. Despite my criticisms, some of the economic orthodoxy, the use of economists to measure what you are getting out of what you put in —

The Chairperson: Just to redefine it, whenever we would bring forward a project, any project, whether an SBIR project or a big government thing, we have an economic appraisal. The difficulty is that, sometimes, the economic appraisal takes a long time to go through. Phil is asking how you assess whether something is invested in, because you said that only 20% get accepted, and whether you do any follow-up to see whether it worked out.

Mr Flanagan: Secondly, it is fairly difficult to do an economic appraisal for something that is innovative. A couple of examples are doing the rounds here of projects that were turned down because they are too innovative and were identified as too risky. What are your thoughts on economic appraisals?

Dr Wessner: One comment that reflects what I tried to cite in this brief talk is that it is too risky to leave the future to others. Some risk is always involved with new technologies. As a general rule, the US sets out broad parameters. Let me just remind you that we invented environmental controls. The Environmental Protection Agency was founded in the US before the Europeans had any idea of this.

We are not a group of crazies, but we do not think that you can fine-tune regulate things all the way down to the last millimetre. What you do is set up broad guidelines. The trick is to make sure that those are enforced and, where you find violations, you fine or lift a permit and correct those.

It is not a good idea to try to set up regulations that become too onerous. We had that problem. A good example is our nuclear industry. Such fear was created by the non-event at Three Mile Island that the process of getting a permit is now so onerous that you cannot build a reactor. One of the problems is that a lot of groups want it that way because they do not want to see the reactor built. So you can abuse the regulatory process to the point that you are suggesting: where it just stops innovative activity. That does not mean you do not have regulation.

The post hoc evaluation is important. I suggest having regulations in place at the beginning and monitoring what goes on in new activities, whether it is fracking or some other type of energy supply. With programmes like SBIR, we do a post hoc assessment of whether it worked. For that, we used traditional economic tools. We interviewed and surveyed companies and found that it worked better than we thought. What I am saying here is driven by data. It is not something that we just decided we would like to programme. It works a lot better than we thought. Does that answer your question?

Mr Flanagan: I will be honest with you: no. Maybe I did not clarify it well enough. I was not talking about fracking or any kind of kind of environmental works. I was talking about the fact that the Government here set aside £12 million for energy efficiency works. There were two propositions on the table. One of those was a simple boiler replacement scheme, where the Government gave out grants to householders to upgrade their oil or gas boiler. The other option was a green new deal scheme, which encouraged householders to take out a loan to invest in energy efficiency measures to improve the efficiency of their home. That took in substantial funding from the private sector, but it was turned down on the basis that it was too risky and too innovative. They opted for a scheme that will have a much smaller impact on tackling fuel poverty and improving energy efficiency. That is what I was trying to tease out of you about economic appraisals.

Dr Wessner: I fear I would be in your camp, or at least what I think is your camp. I think that the more innovative approach is better. Arguably, you can do both, but it is very important to avoid the tendency towards a completely risk-free environment. We suggest doing a scheme like that and monitoring it carefully. If it is not working, fine-tune it. You learn by doing, not by sitting back and wondering what will happen.

The Chairperson: If you do not mind me cutting across, Phil, the model that I pick up from the SBIR is that if you have a problem, people are quite happy for you to have multiple shots on goal, whether one, two or three. You get \$150,000 to get to proof of concept and go out and do it. If you make pretty quick progress in six months and it is working, you will get \$1 million to go and do a bit more. If you do that fairly quickly, you are taking the risk out of the system. I just know that, as regards moving things forward —

Mr Flanagan: You cannot do that here because of the Public Accounts Committee.

The Chairperson: We have talked about the Public Accounts Committee, and there is an issue that comes back around. A lot of information has come at us today. What I am interested in from what Charles is saying is that it is a different model. It is a model that we could go along and see. We do not have to agree or accept it, but it would be worth having a look at what this really successful public intervention in small businesses actually leads to in the long-term big picture. That is what a lot of us have been saying, but we have not had a mechanism to go and do it. I happen to know that Charles would be in complete agreement with you, Phil.

Mr Flanagan: That is all that I wanted to hear. If you had said that at the start, I would have shut up. *[Laughter.]*

The Chairperson: It was good for you to ask the questions. Time is moving on, and I will say a few more words. Would anyone else like to ask a question?

Mr McElduff: The culture of risk and not being totally punished for failure is a big American thing. Could I ask Charles to speak about that? We are afraid of risk, and Americans, especially American companies, tend not to be afraid of risk. If you do fail, it seen as, "Well done for the attempt."

Dr Wessner: That has to do with both cultural factors and your legal system. One reinforces the other, particularly if there are legal punishments for having tried and failed. I will give a brief description. The story goes that if an entrepreneur in the US fails, she comes home and her husband says, "I know you tried hard. Let us go out and have dinner, and we will talk about what you are going to do next." There is no end-of-world scenario. In Finland, when the entrepreneur comes home and tells his wife that, she drops the dishes, bursts into tears and says, "My God, how will we ever pay back the debts, and where will we live?" We have chapter 11, which protects you from losing your home and protects you from having to pay those debts. We can take those shots. If the dean of Stanford had told Larry Page and Sergey Brin that they would be risking their entire future career and all their future earnings, they would not have taken the shot, and we would not have had Google. Speaking to you as parliamentarians, you need to fix that.

Mr Chairman, I apologise for my directness, but it distresses me when people look at the US as if it is some other planet. It is inhabited by your ancestors. We are you; we just have a different deal. It is the same stuff. There are things that we need to change and which we wrestle with. We have some people who do not understand our system well, but you need to do some things differently. If you do, you will get different outcomes. You want to make this a green island and an innovative island. To do that, there are some things that need to be cleaned up. Some experiments need to be tried. By the way, I am very much in your camp about conservation. One of the most important things that you can possibly do in the energy space is to stop wasting it.

Mr McElduff: The idea that we are on a different planet is fuelled by the fact that we are in the Armagh Planetarium. *[Laughter.]*

Mr Lyttle: The thing that I found interesting about the system was the cross-departmental, pooled nature of the funding. In Northern Ireland, the idea that Departments would pool resources and work together would blow people's minds.

The Chairperson: If I have got this right, Charles, the individual Departments have to have money set aside in their budgets. If the Department of Health here had a budget of £10 billion, it would have to put x per cent aside for innovation. You can spend that innovation money on things that are important in health, for example improving the syringe, but you have to do that and you have to give the money to small companies. I think that there is something in that. I will bring in Tom to speak very briefly, and I will ask Suzi to explain a bit about what she is doing next. Perhaps I am putting you on the spot, Tom, but since you are hosting us, have you any questions for Charles, and what did you think?

Dr Tom Mason (Armagh Planetarium): I have three pages of stuff.

The Chairperson: We can talk over lunch.

Dr Mason: I go to the United States frequently, where there is a completely different legislative system. As has just been said, risk is encouraged. Having lived in Africa for 20-odd years, I am afraid that the thing that strikes me most dramatically is that there is a lack of appetite for risk — it is absolute madness. If you do not risk, you do not learn. You have to learn stuff, and learning does not mean being tossed in the slammer because you have wasted \$10 million. Do it again, and get it right the second time. That is what they do in America.

The Chairperson: Professor Jarvis, you have a programme coming up that involves collaboration between a number of universities, North and South of the border, and Charles has already mentioned potential linkages with the United States. Can you tell us for the record what the programme looks like?

Professor Suzi Jarvis (Innovation Academy): We have European funding to work with the University of Ulster with undergraduates across the border, and we are developing a programme with Queen's for PhD students. As unemployment is of concern on both sides of the border, you may be interested in the Springboard programme that we are starting to get involved in. It provides 6,000 places this year for unemployed people — we work primarily with unemployed graduates — to come back into education and reskill. We found that we are bucking the trend for this programme because, rather than focusing on getting unemployed graduates into employment, we are focusing on unemployed graduates creating their own employment to become self-employed or to set up small businesses. Surprisingly, we found there to be a huge appetite for this, so our programme is massively oversubscribed and we are starting to take places off undersubscribed programmes. It is a

relatively small investment of government money, but there is a real appetite for this, probably because the people whom we are talking about face less risk. They do not have anything to risk: they are unemployed. It is really worth thinking about extending that to both sides of the border.

The Chairperson: You are the director of the innovation centre —

Professor Jarvis: The Innovation Academy.

The Chairperson: The academy is one of the lead organisations in the Republic of Ireland Government's drive for innovation and against unemployment. The final bit that I will say is that it is because of Professor Jarvis that we have been able to hear from Charles. I will conclude, Charles, by saying that, in other places, you made an offer to some of us, perhaps, to come over to see you in the National Academies, or at least get some involvement, and you said that there is an open door to really large research opportunities. You said that we need to get out more; we need to get off the island.

Dr Wessner: Over a beer last night, I said that you need to get off the island and you need to welcome people here through that type of outreach. Look, I just did what I have done here with the Czech Republic, with the Czech Technical University. On my initiative, and with the support of the Office of Naval Research (ONR), we held a programme on innovation that was remarkably successful. I specialise in bringing in operational people — the guys who will be there, whether it is Romney or Obama — the ones who control the money, year after year. You develop personal relations; they talk to a professor and realise that he is doing good work. ONR can fund that. Too many people focus on the National Science Foundation, which is almost comic, because it cannot fund overseas work. ONR and the National Institutes for Health (NIH) can, but the NIH is six or seven times larger than the National Science Foundation. So that is where the money is.

It was such a success that the President's science adviser, John P Holdren, followed up with a special meeting with his Czech counterpart. There will be a meeting on Thursday and Friday this week on co-operation, which, before I became trapped in Ireland, I was supposed to go to. My point is that these meetings are not just conferences for conferences sake; you can actually generate the co-operation, networking and funding that are needed to address our common problems, whether in energy, climate change, health or security. These are all real issues. The role of the academies is to act as a catalyst. We work with the Defense Advanced Research Projects Agency, we work with the US Navy — these are not joke organisations. They are not doing this to be funny and friendly; it is because they want to co-operate with people who are smart, and you have got a lot of smart people here.

The Chairperson: Just to be clear, just because you are working with the navy does not mean that you are doing so in armaments. There are all sorts of other issues, such as the health of service personnel, or this and that. I know that some people have got issues about armaments, but the fact is they are interested in the totality of research, including into cancer or whatever it happens to be.

Dr Wessner: AIDS research is a big issue for the military.

The Chairperson: I think that we will draw the session to a close, if you do not mind. Thank you very much indeed, Charles, for your presentation.

Dr Wessner: Thank you. It has been an honour to speak with you and I hope that you will forgive my directness.

The Chairperson: Absolutely. Thank you very much, Professor Jarvis, and thanks, once again, to Tom.