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Chair

Mr. David Sweet

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● (1105)

[*English*]

The Chair (Mr. David Sweet (Ancaster—Dundas—Flamborough—Westdale, CPC)): Good morning, ladies and gentlemen. *Bonjour à tous*. Welcome to the 45th meeting of the Standing Committee on Industry, Science and Technology, where we're continuing our study on the state of disruptive technologies.

Thankfully, with just a couple of minutes of getting to know each other, everybody has arrived, so we're grateful for that.

From Ryerson University we have Hossein Rahnama, who is the director of research and innovation. Then we have a small cavalcade of folks from Concordia University: Graham Carr, who is vice-president, research and graduate studies; Vincent Martin, Canada research chair in microbial genomics and engineering, department of biology. I understand there are two areas of focus for you, and I suspect you'll differentiate that in your own remarks. We have Xavier-Henri Hervé, director, District 3 Innovation Centre, and Sylvie Bourassa, executive director, government relations.

I take it the two groups with Concordia will have separate remarks. Is that correct, Mr. Carr?

Dr. Graham Carr (Vice-President, Research and Graduate Studies, Concordia University): I'm going to give opening remarks for 10 minutes, and then I think Vincent and Xavier are best placed to answer the questions.

The Chair: Okay, there's just one opening remark from you.

Mr. Rahnama, please begin.

Dr. Hossein Rahnama (Director, Research and Innovation, Ryerson University): Mr. Chair and committee members, thank you for inviting me.

I'm Hossein Rahnama. I'm the director of research and innovation at the Digital Media Zone, which is a start-up incubator based in Toronto that we started about five years ago. The vision we had behind the Digital Media Zone was to support young researchers and innovators to be able to work in non-siloed environments to bring their innovation and research to market very effectively.

What we noticed back then in our university was that we tended to silo people, with electrical engineering in one building, fashion in another building, and biotech in a separate building. With the Digital Media Zone, when we brought these researchers together and got rid of those walls, we immediately saw disruptive technologies emerging, whether from our research groups or young entrepreneurs, and they quickly commercialized that research and turned it into start-ups. We built a framework and now, after four years, have created more than 1,700 jobs and about 172 start-ups, and we have developed more than 20 patents that we are trying to move from the research lab to the market.

In observing how young entrepreneurs work, we have made some key observations. They are trying to learn more from each other rather than from professors. They like to go to their classroom, but they are also looking for settings where they can learn from each other. They want to have that freedom so they can go there in their jeans and T-shirts, work around their ideas, and bring them to the market.

What we learned was that the university had to value discovery-based research as much as research commercialization. Maybe a professor didn't want to commercialize the research on her own, but we wanted to give that IP to a group of entrepreneurial students to take to market, especially when we considered disruptive technologies.

The other thing we observed was that our IP policies needed to change. The way we looked at IP from a pharmaceutical lab, let's say, was not necessarily the IP policy that we needed in an ICT or a computer science setting, because the same student could invent the next big thing with just an iPhone and a laptop, so the investment the university had to put in place was very different from the investment for a pharmaceutical lab. We started to favour moving IP towards our students so that they are motivated to bring these disruptive technologies to the market.

There was another challenge that we faced. I spun off a research company from our university, a company called Flybits, which was back then, about three years ago, a research program, and now it's a growing start-up funded by Vodafone, one of the largest carriers in Europe. They brought that funding to Canada. The challenge we saw with Flybits, which is a spinoff from our research lab, was that in Canada we did not have good disruptive technology adopters. We did fantastically in terms of protecting that research, but we couldn't find organizations to say that they were willing to be the first one, that they were willing to be the first adopter in Canada so that we could validate our technology and then export it to the rest of the world.

If you look at Flybits, you'll see that the first technology we deployed was in France for the Paris Métro. Then Metrolinx became interested. We had to bring in Vodafone to invest in the company before we could have Canadian VCs helping us bring that forward.

In identifying those challenges, we are now developing policies at Ryerson in order to be able to help these entrepreneurs and young innovators to bring their disruptive technologies to the market.

I can talk more about the ICT sector especially, because that's my background, but I really appreciate your invitation and am looking forward to answering any questions you may have.

Thank you.

● (1110)

The Chair: Thank you very much, Mr. Rahnama.

Now we'll go on to Concordia University and Mr. Carr.

[*Translation*]

Dr. Graham Carr: Thank you, Mr. Chair.

Ladies and gentlemen of the committee, it is a great pleasure for me to be here with you today.

[*English*]

We've already done the introductions so I won't repeat them.

For some of you who aren't entirely familiar with Concordia University, I'll take a moment to provide a high-level description of who we are.

Concordia is one of Canada's largest comprehensive universities with over 46,000 students, of whom about 6,500 are graduate students. Our main campus is right in the heart of downtown Montreal, with a second, the Loyola campus, in the NDG neighbourhood just a few kilometres away from the city centre. Our student body is one of the most culturally diverse in Canada, and this diversity is one of our great strengths, because diversity is an active ingredient in innovation.

[*Translation*]

Concordia is truly a 21st century university. We have a strong tradition of public and community service, but we are also steadfastly turned towards the future, with our researchers who may well be defining the future of humankind.

[*English*]

Through research, teaching, and experiential learning, we provide our students with global skills to meet next-generation challenges. We're also a young university, 40 years old, with the flexibility and nimbleness to foster transdisciplinary convergence and think outside the box. Times Higher Education ranks us as one of the top 100 universities in the world under the age of 50. We're proud of that world-class ranking. We think we're a university on the move.

[*Translation*]

We thank you for providing us with the opportunity today to express our point of view on the so-called disruptive technologies, using specific examples of what we are doing at Concordia.

[*English*]

As a starting point, let us propose that instead of focusing on the term "disruptive technologies", which can have some negative connotations, we think about exponential technologies, because the changes we want to tell you about involve new processes and new products with boundless potential and opportunity for public good.

As Dr. Martin and Monsieur Hervé can explain in more detail during questions, these exponential technologies are emerging at a dramatic speed with social and economic impacts almost unimaginable to those of us raised in an earlier generation.

[*Translation*]

Our research in synthetic biology and our commitment to innovation, represented by District 3, are eloquent examples of the way in which we breathe life into exponential technologies at Concordia.

[*English*]

Let me start with synthetic biology. What is synthetic biology? Put simply, synthetic biology applies engineering principles to biology to build biological systems that can benefit humankind. It takes the biological information encoded in DNA from one system and renders it functional through its transition and manipulation to another system. The World Economic Forum's "Outlook on the Global Agenda 2015" identified synthetic biology as one of its five top emerging issues that will shape our future, and the U.K. government has identified it as one of eight great technologies.

Some of you may remember an opinion piece from December 2014 entitled, "Power, promise of synthetic biology: time is now to invent our future", that appeared in *The Hill Times*. We have copies. It was co-authored by Dr. Martin; Pierre Meulien, the head of Genome Canada; Marc LePage, the CEO of Génome Québec; Rémi Quirion, the chief scientist of Quebec; and Graham Bell, the president of the Royal Society of Canada. The gist of the article is that synthetic biology has enormous potential for Canada and the world, but we need to move fast to capitalize on our talent and resources to establish our global positioning.

[*Translation*]

At Concordia, synthetic biology is the natural extension of our expertise in genomic research.

[*English*]

We have benefited enormously from federal, provincial, and industrial funding to support our research in this area. The capacity to sequence human and plant genomes is foundational to the biologically inspired engineering that's happening at our centre for applied synthetic biology, the first facility of its kind in Canada.

Dr. Martin, who's the scientific director of the centre, has been a leading exponent of synthetic biology since its inception, both as a researcher and as an entrepreneur. When he was doing post-doctoral studies at the University of California, Berkeley before returning to Canada, Dr. Martin co-founded Amyris, which is now the world's leading synthetic biology start-up.

Drawing on his lab-to-market experience, Dr. Martin's research group at Concordia has built important research partnerships with major companies and institutions across Canada and internationally, such as FPInnovations and Lallemand Bio-Ingredients group. Canada's emerging bioeconomy will be one of our most important national investments in the coming years, and synthetic biology is uniquely poised to foster talent development, industrial productivity, and social gain in this important sector

For example, synthetic biology is instrumental to the development of cellulosic biofuels, fuels produced from what would normally be wastage from wood, grasses, or the inedible parts of plants. Breakthrough uses of synthetic biology are not only crucial from an environmental sustainability standpoint, but offer new ways for established Canadian industries in the resource sector and health care to be internationally productive, competitive, and innovative.

● (1115)

[*Translation*]

For Canada, which is blessed with vast natural resources and an educated and experienced workforce, this area of economic activity is of paramount importance.

[*English*]

The societal and economic impacts of synthetic biology are also felt globally, beyond Canada's borders. For example, in 2013, Dr. Martin was part of an international research group that successfully engineered the synthetic production of artemisinin, a breakthrough, low-cost, anti-malarial drug that has the potential to save hundreds and thousands of lives every year. Synthetic biology is also used to develop new forms of antibiotic medications, as many traditional antibiotics have been rendered ineffective because of resistence.

One of the most exciting things about synthetic biology is its capacity to spur innovation, excite next-generation scientists, and nurture a start-up culture of entrepreneurship that seeds new businesses and inspires established industries from forestry to pharmaceuticals to rethink key elements of their business model.

Let me build on that training and entrepreneurship piece to tell you a little bit about District 3, Concordia's incubator of innovation and entrepreneurship, which is a runaway success for us. An engineer by training, District 3's executive director Xavier-Henri Hervé was also involved in the development and marketing of a major innovative technology when he co-founded Mechtronix, a leading developer of aircraft simulators in Montreal.

[*Translation*]

District 3 provides a unique space where young inventors and entrepreneurs can reach their full potential in a constantly evolving business ecosystem.

[*English*]

As those who have visited can tell you, District 3 is essentially an open ideation and maker space, a place where young innovators and entrepreneurs can experiment with outside-the-box ideas. They come with tutelage and mentoring from entrepreneurs and residents. The students work on teams with multiple disciplinary formations, skills, and perspectives. They come from all sorts of backgrounds, from mechanical engineering to business and marketing, from math and computer science to computer art and design.

Diversity is an impetus to innovation, so District 3 is open to all of our students, undergraduate and graduate, as well as students from other universities and recent alumni. They don't come to D3 for academic credit. Instead, they come for the opportunity to create and invent a product, either through a mandate from an existing SME or perhaps to form a company of their own. As Monsieur Hervé can explain in more detail during questions, the essence of District 3 is to foster new forms of collaboration that can help drive great ideas closer to market and provide an open sphere for students where there's absolute freedom to create, innovate, and become start-up entrepreneurs.

One of the things District 3 captures is the agility of SMEs and their capacity to be nimble and agile, to see outside the box, to see exponential possibility where others just worry about disruption. Our experience is that students now want more and more to add this experiential profile to their formation at university, but the shift in student demand also coincides with and reflects a larger economic trend in Canada and internationally, where value is increasingly created by smaller, more nimble and agile businesses and industries.

[*Translation*]

By virtue of the very fact that they are completely shaking up normal ways of working, exponential technologies are certainly providing not only enormous economic possibilities, but also unexpected solutions to social problems.

● (1120)

[*English*]

I cannot stress enough the huge opportunity that the emerging bioeconomy offers to a country like ours, blessed with a fantastic resource sector and a well-educated, highly skilled workforce.

Because of their paradigm-shifting nature, exponential technologies have enormous potential not only for industrial growth and product diversification in the marketplace, but also for the health and well-being of society. Therefore, their efficient development and implementation requires constructive engagement with public health experts, scientists, government regulators, and law enforcement agencies.

These technologies are making business move and change at speeds we have never seen before. Without a well-defined regulatory framework for innovators to work in, we run the risk of missing out on opportunities. With speed and agility comes increased mobility. We all have an interest in keeping the best and brightest minds in Canada, building businesses and industries that create wealth across the value chain for all Canadians.

The good news is that Canada does not lag behind in regulating and legislating disruptive and exponential technologies. On a recent visit to the U.K., Dr. Martin and I learned that many of our research colleagues in the field of synthetic biology are envious of the fact that Canada's regulatory model focuses on regulating processes and not products. This allows for a more unified, coherent regulatory environment for innovators, industry, and government partners.

As a leader in synthetic biology, Concordia has been very proactive in discussions with Health Canada, the Public Health Agency of Canada, Environment Canada on the Environmental Protection Act, Industry Canada, Canada Border Services Agency, and the RCMP. The exponential pace and scope of change unleashed by innovative new technologies creates the challenge of how to develop a regulatory regime that simultaneously ensures public safety, while reducing the lag time from research to market.

As we move forward with our innovations in synthetic biology and beyond at District 3, we'll continue to engage our industry and government partners to find solutions to emerging public policy challenges.

[*Translation*]

Thank you for your attention.

[*English*]

and we look forward to continuing the conversation with you now.

The Chair: Thank you very much, Dr. Carr.

We'll say seven and a half minutes across the board for everyone, and we'll begin with Mr. Lake.

Hon. Mike Lake (Edmonton—Mill Woods—Beaumont, CPC): Thank you to the witnesses for coming.

In the last few weeks I have had the benefit of visiting both the Digital Media Zone at Ryerson and District 3 at Concordia. I had a chance to see some of the practical applications of what you're talking about, and the disruptive technology was pretty astounding.

We saw people who were developing clothes that track the patterns and movements of athletes who are trying to become as efficient and as strong as they can be and get instant feedback on what's efficient and what's not in what they're doing. I saw toys that teach six-year-olds how to build circuitry. There are some incredible innovations there.

At the Digital Media Zone I see what you're talking about in low-cost developments. I met a couple of app designers who are designing apps to run your home from wherever you are, and a receipt management app that was so practical. It was pretty amazing stuff.

I have a couple of questions and a couple of lines of thought.

First, as we try to put someone on a path to the next Google or BlackBerry or whatever their goal might be, as they're developing something, where do you fit in that mix? How far along that path are you looking to take folks? At what point would you pass them off, and where would they wind up moving on to from your areas?

Dr. Hossein Rahnama: That's a great question.

At Ryerson we are looking at it as a spectrum of innovation. We start in the classroom, probably from the second year of undergrad studies, and we introduce the curricular model that we call the super course. We bring students from different disciplines together, from fashion, media, computer science, mechanical engineering, and put them all in one very big lecture hall. The professor is teaching them about the process of innovation and entrepreneurship. At the end of that course they are going to develop their first prototype, and they are going to get an academic credit. They start early.

Then we pass them to an area at Ryerson that we call the launch zone. This is still in the ideation phase, but they need mentorship to be able to bring it to the functional prototype stage. During about one or two semesters in the launch zone, they will figure out the business models. They will figure out the disruptive and high-impact factors of their innovation.

Then we prepare them to bring them to the Digital Media Zone. The Digital Media Zone has about five floors now. They start on the fifth floor, as if it's a school; they practise and validate their technology.

With the help of the FedDev program from the federal government, we also built a centre called the centre for cloud computing, which is more focused on research commercialization. It has access to a large IP pool. These groups of students have preferred access to these IP portfolios so that they can create some sort of science behind what they are working on.

When their business model is more mature, we have connections to seed investments and to government funds through our office of research services. We prepare them to bring their innovation forward and we move it to the acceleration phase. That is an entity that we call the Ryerson Futures, which helps them with seed funds and connections to VCs.

After they pass that phase, then they are basically graduating from that program. We try to connect students from very early undergraduate years, and also connect them in the master's, Ph.D., and post-doctoral levels, irrespective of who they are, and what discipline, and what level of studies they are in. We look at it from the spectrum point of view. The earlier they start the better, because they have more time to focus on their innovation and not worry too much about the complexities of building the business from day one.

A mistake we have seen a lot is that they think they need to have a company right away. When they do that, they need to worry about tax, employment law, about everything, so they cannot focus on that disruptive factor of their innovation. If we help them in the fail-safe environment of the university, they are going to be more prepared when they graduate from the DMZ program, and then they can enter the market in a stronger way.

●(1125)

Hon. Mike Lake: Right.

Mr. Hervé.

Mr. Xavier-Henri Hervé (Director, District 3 Innovation Centre, Concordia University): I think the description that you were given is a great one. I think that system works well.

Essentially what I'd like to bring to it are two core concepts. One of them is that, as Graham was saying before, some of us are in generations and there are things that we have no clue can happen. As CEO of my company until two years ago, when I saw what these young people could do and at the speed at which they could do it, it was unbelievable for me. There were things that I would call complex weapon systems that were literally being developed in kitchens. That's something that most people can't grasp, and trying to pretend that doesn't exist is both a loss of wealth and loss of an opportunity to manage it as a society.

I would bring a second level to what was just explained. Think of the economic world as a pyramid—I think of it that way—and at the top there's Bill Gates, CGI, Bombardier, and all of these people and then you get all these SMEs. The people who innovate are the people who think of a different way and then they enter the system.

It's like you have to create these sphere environments, little planets that you create where you allow them the freedom to do what they need to do. That gives you both a controlled test environment, if you want to think of A/B-testing, and an environment where they're allowed to transform it into economic value.

The other thing that I think DMZ is working really hard at, and Concordia has the same challenge, is our researchers are not inherently imprinted to turn their research into economic value, and the numbers show it. I read a recent article that showed technology transfer offices across Canada have a net gain of $10 million per year in different licensing fees and stuff like that. You have to think of the numbers. We have a huge challenge. We're one of the biggest investors on the planet in research per capita and we have one of the lowest returns when it comes to money from that research.

Creating these spheres allows our people, our population, to develop that wealth. I completely agree with what was just explained. There is tons of risk, tons of things to manage, but if we don't create those spheres to learn how to manage them and experiment with them, which I have had the fortune to do in the last year and a half.... That really was a discovery for me. At my age, I couldn't have known this. Without sticking my hands in it, I wouldn't have known it.

I hope that answers your question

● (1130)

Hon. Mike Lake: Yes.

The Chair: Thank you very much. We have to deal with something as innovation-killing as time. That's all the time Mr. Lake has.

We now go to Ms. Nash.

Ms. Peggy Nash (Parkdale—High Park, NDP): Thank you so much for being here. Your presentations are very interesting.

I've not been to D3 but I have been to the Digital Media Zone. It's fascinating and it's really quite exceptional to see the ideas that come out of this kind of facility.

Something we were discussing in our last meeting with our previous groups of witnesses was that connection between the resources that we as a country invest in our educational system and in research. We are very lucky to have not only natural resources but also this investment in science and technology along with all of the research capacity.

If I'm hearing you correctly, the kind of thing you are trying to do is in fact to translate that public investment and private investment into creating wealth, creating jobs, creating innovation, and taking us forward. As you quite rightly say, we are not doing a good job of that now.

We're always looking for recommendations. Do you just recommend we replicate the kinds of things you are doing across the country or is there another level that the kind of work you are doing should go to? Can you tell us a bit about the kinds of things the government should be doing in a perfect world to assist in this tremendous creative process?

Mr. Vincent Martin (Professor , Canada Research Chair in Microbial Genomics and Engineering, Biology, Concordia University): Maybe I could speak to that.

As researchers, we often find ourselves having to partner with existing industries. A lot of our granting programs and our research funds come from partnerships with industry, so you realize that what you are ending up doing, which is not a negative thing, is doing a lot for research to support, as Xavier was saying, the guys at the peak of the pyramid, but very little research effort and money go to that bottom level.

If I could make a recommendation, it would be to not stop supporting the existing people and the ones who are out there, but to focus a little bit more attention and energy, using whatever mechanism you choose to come up with, on supporting the smaller companies and ideas and entrepreneurs and helping them move through the process so they can become the bigger companies. As a researcher, I have no mechanism to do that now. I have to find a big company that is willing to give me a big amount of money to support a short-term project within that.

Ms. Peggy Nash: I assume you take the risk that within any initiative, and especially with something that is very groundbreaking and innovative, there are going to be failures and that's part of the risk process. I think what I heard some of you say is that what your centres are doing is providing a safer environment for this to happen at the beginning stages, but we don't seem to be providing enough support to follow through to take it to the next level. Is that the kind of thing we need to do more of?

Mr. Vincent Martin: Risk is definitely very important.

It's funny, we were discussing this in the car on the way over. A lot of our granting programs in university, and we're really talking about university systems here, are geared towards moving away from risk. Not only that, but some of us who are applying for these grants get to a certain age, as Xavier has already mentioned, where we are averse to risk. With the younger guys, that's all they want. That's the time to take risks, when you don't have a family or a mortgage or anything else and you want to try different things, and you should be willing and want to take those risks. That's where it has to go.

Ms. Peggy Nash: Thank you.

Professor Rahnama.

Dr. Hossein Rahnama: That is a very good point you mentioned, because it's another way of looking at both our research and our educational system. If you have a bad mark in your transcript, it will stay with you forever, whereas if we create these parallel environments that if you fail your first start-up or your first ideation, it's actually a good thing, because now you know how to do it better next time.

It needs some programs in our institutions to be able to value those failures, but also build models that the entrepreneur can learn from.

The other thing I noticed is that we have fantastic research, as Xavier mentioned, in our research labs. The challenge is that we cannot translate them into economic growth metrics and commercialization. One of the key things we observed is that there are no metrics to value our professors to become entrepreneurial. It would be great if a university could say it values you if you publish a paper in a high impact journal but it also values you a lot if you can commercialize your research and turn it into a start-up. That way you could attract professors who are motivated to turn their disruptive research into a commercialized aspect.

The other thing we observed is that France has a great program that incentivizes large companies to partner with start-ups. If we could have that in Canada, because the biggest challenge that start-ups have.... With my own start-up and things we have seen in the DMZ is that big enterprises in Canada are not willing to take the risk, because they want to see that three other people have used your technology before they will use your technology. If we could incentivize them to partner with these start-ups and be the first adopter of that technology in Canada, I think it would significantly expedite the time from the lab to the market.

●(1135)

Ms. Peggy Nash: Thank you.

I was going to ask you why Vodafone and Paris Métro, and not Metrolinx. Initially they were waiting for someone else to try your app. Yes?

Mr. Xavier-Henri Hervé: I would like to support that statement 100%.

With Rector Alan Shepard we organized two innovation conferences, board meeting level and invited executives. Lawyers and consultants showed up, but not a single executive from a senior corporation showed up, so either we're not credible, or they don't care. It can be true in either case, right?

There's something that's not making any sense in our ecosystem. There's no notion of early adopters. I was in San Francisco for a full week last week, and the repeated statement was the start-ups are stealth weapons. That's how they see it.

The big corporations can't do it. It's against their short-term interest; it doesn't work. The more you go to feed those systems.... The French have got it. The Europeans have got it. SAP, which is a German company, has a fund for start-ups. I could list 50 of them that have done it, but I can't come up with a number of Canadian ones that have done it.

We have this early adopter. I completely agree, we definitely have a lack of awareness of our corporate system in early adoption of these technologies and how to do it with these fear systems, you know, these parallel planets. Everyone has to align with this. Others have. The French have. Silicon Valley has. There's no reason why we shouldn't. There's nothing stopping us from doing it.

The Chair: Thank you very much.

You reminded me of a Winston Churchill quote that the definition of success is moving from failure with great enthusiasm.

Madam Gallant, for seven and a half minutes.

Mrs. Cheryl Gallant (Renfrew—Nipissing—Pembroke, CPC): You talked about your spheres at your individual universities. What interaction is there between universities with these spheres?

Dr. Hossein Rahnama: Very broadly, I think what we need as a country is that these innovation centres start to work together and emphasize the areas they are strong in. We do not need to replicate exactly the same type of sphere across Canada. We can have an ecosystem of these zones or innovation centres or incubators that are complementing one particular innovation spectrum, in the sense that one can be focused on aerospace, and the other one can be focused on ICT, and one can be more focused on existing start-ups, and the other one can be focused on commercialization of research.

We need to build programs that can connect these nodes together. We have seen initiatives like that. I've had the privilege to serve on the board of NSERC. There are very good examples that we are starting to see, but they should not necessarily compete with each other in wanting to be the biggest incubator versus the other. They need to complement each other in terms of a national offering that students and entrepreneurs have access to.

Mrs. Cheryl Gallant: At this point in time, what type of interaction do these various innovation centres have? Are they talking to one another? Are they showing each other what they have? Do they know what each other has in terms of resources?

Dr. Hossein Rahnama: Yes. I mean, Concordia and Ryerson are great examples. We have visits. We have students coming to us from U of T and Waterloo, and we have other areas, such as Communitech, participating. Hopefully we can scale that further.

We would like to scale that, but it's happening already through unique programs that each institution offers in partnership with others.

● (1140)

Mr. Xavier-Henri Hervé: I can add something to that.

I went to DMZ for the first time two years ago. The simple fact of walking in there was part of what I told you was my aha moment about what can be done. I think for a lot of us who have visited those places, we just feel the vibe—there's no other way to explain it—in those spaces, to see how rich they are.

I also think that Communitech is a phenomenal regional example. I don't know how familiar you are with Kitchener and that whole ecosystem of start-ups. You might remember the old cellphone champions. We've had many other champions throughout the generations come out of that area. When you go for breakfast with one guy in the start-up community, at Communitech, by the time you show up at lunch, the guy at lunch knows who you met at breakfast.

The regional communities are really important. I agree with the networking because it's helped me, but for me, most important is the focus on each region. I wouldn't necessarily verticalize it; that I'm not an adopter of, because I believe innovation is an organic thing. At Concordia we have research in nanos. We have research in power transmission. We have research in a lot of these exponential technologies, including artificial intelligence. We have to let those ecosystems come of their own. If you try to regulate it too much, or organize it too much, I think you're going to defeat the purpose, personally.

In terms of verticalization, I wouldn't be on the same bandwagon, but certainly I'm on the bandwagon that says we need regional communities that are very, very strong. Communitech is the best example I've seen on the frigging planet, and I've visited across the planet. It's a very rich model to follow. Iain Klugman is a phenomenal man for having created that, and he did it mostly out of cause and belief.

Mrs. Cheryl Gallant: Okay.

For Concordia, you mentioned cellulose and plants and using biofuels. Are you referring to a company called CelluForce, situated in Windsor, Quebec? Do you have an affiliation with that company?

Mr. Vincent Martin: No, but I know what you're talking about. This is an innovation that came out of the pulp and paper industry on nanocrystalline cellulose. It's Domtar in Windsor that's doing this. It's an example of the forestry industry trying to come out of the slump they're in right now and developing their next markets and their next products. They're very much turning to these kinds of technologies, these kinds of ideas, because they realize that they can't compete with the Brazilians head-to-head on prices of pulp or fibre or something like this. They're looking at their next generation of products. That requires truly out-of-the-box thinking and innovation. It's definitely a place where this kind of thinking and environment could really help the industry.

Mrs. Cheryl Gallant: Has there been any interaction between either of your universities and CelluForce? It's obviously not in production yet, so there must be some obstacles they're overcoming. Has there been any interaction?

Mr. Vincent Martin: Concordia itself, no; I know that other universities in Canada have.

I think the problem with CelluForce—again, I'm not an expert in nanocrystalline cellulose, but it's a great product, a great technology—is that now they're looking for markets. They're actually producing some of these things in Windsor. I think they have them stockpiled. Just this year, I believe, they're finding uses and they're getting it out the door.

It takes a while to create a new market and a new demand for a new product, but they're getting it off the ground, as far as I know.

Mrs. Cheryl Gallant: Volume-wise, do you have any idea of where they are?

Mr. Vincent Martin: I couldn't tell you exactly what those numbers are.

Mrs. Cheryl Gallant: Okay.

The funding, you're saying, is going to these spheres and these innovators and Communitech—particularly I'm looking at universities right now—but we're not getting the return on investment. Should there be more interaction with the private sector somehow, or is that already going on? How do you connect with the private sector? How do they find you? Is there some entity within the university that goes to the private sector to show them what you have?

Dr. Hossein Rahnama: I can talk about Digital Media Zone. Every week we have 10 to 30 tours coming to Digital Media Zone, from very large enterprises to start-ups.

We have about 80 start-ups now that are moving towards graduation and they would love to meet with enterprises and partner with them.

What we have heard a number of times from larger organizations is, "I love your technology but I cannot procure it. As soon as I move you to my procurement process, you will lose because you are competing with the IBMs of the world and so on."

Procuring that innovative start-up technology is becoming a challenge for these large enterprises. They are willing to give a grant here and there to the university, but a lot of them have challenges adopting that technology and partnering with a risky, small start-up, because the committee who is deciding on the procurement will have difficulty justifying it.

If there were new models so that those technologies could be adopted quickly, validated quickly, and brought to market, I think it would show how effectively we can translate disruptive research to commercialization.

It has happened to us a number of times that the CEO of a very large organization has come and said, "I love your technology but I cannot procure it in this timeframe."

● (1145)

The Chair: Thank you, Mr. Rahnama. That's all the time that we have.

We will now move to Madam Sgro.

Hon. Judy Sgro (York West, Lib.): This continues to be a fascinating subject.

I want to start with your changing "disruptive" to "exponential". "Disruptive," I think, caught most of our attention when the parliamentary secretary introduced it and said that we should spend a bit of time on that, but I do think "exponential" would be a better term for it because it's much more optimistic, futuristic, and all the things that we want to see, which you have talked about.

Tell me if I'm wrong, but I think that the risk issue is huge. We're not famous for taking risks as Canadians or as governments. How do we overcome that? I've visited Communitech and a variety of other places. I see the excitement among so many people, but I also see the frustration of many of those young, bright minds at not being able to get the kind of support they need to take extra steps. They have great ideas, and many of them end up crossing the border into the U.S. How do we make Canada a silicon valley?

I'll leave it up to you to use my time telling us how we need to get there and what the government needs to do to help you.

Mr. Vincent Martin: Maybe I could address this.

I sat on a panel for Genome Canada. They actually call it "disruptive technologies". We spent the first three months of the panel discussing what is "disruptive". How do you justify taking taxpayers' money and risking it all the time? They're not going to like that very much.

They realized that with risk there are the rewards that come with it, so you do have to take the risk. How do you manage that risk?

You can't predict where innovation is going to come from. This has been demonstrated over and over again. The idea is to carpet bomb the environment. Give everybody a little bit of money and let them play for a little while, but make sure you have someone on top of it who's looking at these things so you can capture that innovation and that risk when it happens.

From the 250 people you give money to, 20 are going to come out as potential winners. Then you move them through the system. Eventually you de-risk the proposition by using a process that way. You may or may not be able to identify the winners. Take lots of small risks. This is what venture capitalists do. They take lots of small risks over and over again. One in ten is going to pay off, but that tenth guy is going to make up for all the losses you took before. You have to create a system that allows you to do that.

Mr. Xavier-Henri Hervé: I would complement that and say make a difference between the start-up zones and the innovation zones versus the research zones. The research zones are the ones that are having a hard time creating value. If you look at the numbers of the start-up zones. they are creating value. I submit they create two values, one of which is creating straight economic value for sales and returns.

Out of the 50 companies that I had the chance to coach for the last year and a half, the top 10 raised about $2 million and created many jobs. I don't have the exact numbers; I can send them to you. The most important part is they created a huge labour pool. They created 500 engaged students who are walking out with their diploma with a track record. When Google comes in and says they're looking for people, not only do they want 4.0 GPAs, and social skills, and multiple languages, but they also want them to have gained experience in what they call the open source market. You have to realize you're also creating a huge labour pool by doing this with the knowledge that those corporations need, and they don't even know they need it yet, but I do because I can see they need it.

I think when you're giving a mission for that sphere zone to develop—it has to do a mission—you have to give a mission of creating labour for the bigger guys because they're going to need it faster than they know it yet. The day they need it, the competition is fierce. The biggest competition they have in Silicon Valley is keeping their employees within their startups. As soon as I create anyone remotely smart in the District 3 phase, a lot of them get hired. Now we've started by training them on how to do their LinkedIn profile, because I know they're going to get hired anyway. We've decided to be two steps ahead of the ball because it's going to happen to us anyway and we might as well manage the process. It's a very complex thing. These sphere zones need to be thought of as labour zones and knowledge zones, knowledge transformation zones.

●(1150)

Hon. Judy Sgro: How can government assist more? Is it just an issue of putting some dollars out there or being more specific—

Mr. Xavier-Henri Hervé: Sorry to interrupt your question.

Hon. Judy Sgro: Go ahead.

Mr. Xavier-Henri Hervé: I get excited too quickly on these subjects, as you can tell.

I think Vince said something really important, and so did DMZ. DMZ almost invented this concept in Canada. It's the fact that today most hardware prototypes require less than $5,000 to build. I told you about that guy who built the weapon system, which was a heads-up display helmet with a camera on the head of an airplane. The one-metre wing span airplane was flying like the stuff I see at the Heathrow or Le Bourget air shows. It cost him $850.

You have to bring things back into perspective. Ninety-nine per cent of prototypes will cost less than $20,000. We're not talking about the seed money spectrum. What we're talking about is a whole quantity, with the proper management system over it, and our metrics have to be for both labour and value.

Mr. Vincent Martin: Maybe we haven't talked much about this, but I'll sneak it in because that's what I do.

What you just heard on the electronics side, the technology side, the biology side is lagging behind a little bit. You hear about pharma taking $1 billion to develop a drug. Well, of course, there's the clinical trial, but the R and D is very, very expensive and mostly because there's a lot of trial and error and guessing and playing around, and that's an expensive process. Synthetic biologists are trying to do the same thing that they can do now in electronics, to build your prototype quickly, and to build all sorts of weird things in test, and then put them through the pipeline in a much faster way. Again, they're trying to accelerate exponentially the development of whatever they're trying to do.

Dr. Hossein Rahnama: Regarding the way we look at funding, I think if you value the commercialization of research, out of which we get disruptive technology, compared to classical discovery-based research, the funding should also become more outcome oriented because the way our granting model works now is that it's very input driven. Submit your grants. I look at your profile. If you have secured these grants over the past years, it's good enough justification that I give you this grant. If we have a young researcher who is just focusing on the outcome—look at the industry attention that I have; look at my prototype—it's extremely difficult for that researcher to get government funding, because the model is very much input driven. If we make our funding model also equally a bit outcome oriented—show me your industry attention; show me the projects that you have launched—and we use that as a criteria to fund your development, I think that works a lot.

Another great example is in the U.K., in the Shoreditch area east of London, where about six years ago the U.K. government was convincing people to move there and now they call it Silicon Roundabout. It's a fantastic place in London, full of entrepreneurs, full of researchers. At the same time, after the government did that, universities such as UCL, University College London, and Imperial College started to put their campuses there to connect to that ecosystem. If the government rallied behind an initiative like that, you can get ecosystems like Tech City in London.

The Chair: Thank you very much. That's all the time we have on that one.

Hon. Judy Sgro: Mr. Chair, there was reference to an article in *The Hill Times*. Could we get a copy of that?

The Chair: Yes, they brought copies.

Are they in both official languages?

[*Translation*]

Ms. Sylvie Bourassa (Executive Director, Government Relations, Concordia University): No.

[*English*]

The Chair: Okay, then, we'll get them to the clerk and then we'll have them translated.

Now we go to Mr. Carmichael, please.

Mr. John Carmichael (Don Valley West, CPC): Thank you to our witnesses this morning.

As my colleague said, it's a fascinating and energetic topic.

As I listened to you, I hear two very much good news stories. Yes, I heard the discussion of Silicon Valley, and some of the slippage across the border, where some of these other markets are perhaps drawing some of our creative talent.

Maybe, Dr. Carr, you could just comment briefly. Are we playing catch-up or are we in fact at the forefront? I'm hearing some incredible stories here this morning. It sounds to me like, with some focus and some reapplication of energy and direction, we have a great opportunity here.

● (1155)

Dr. Graham Carr: I agree we have a great opportunity. Are we playing catch-up? Silicon Valley is Silicon Valley, and we don't have

a comparator for that, so yes, we're playing catch-up, but maybe that's not the realistic point of comparison.

Montreal is a city that, next to Boston, produces more graduates on an annual basis than any other place in North America. There's an incredible intensification of talent in Montreal. Toronto has huge talent. But it's not just the big urban centres that have the talent. Other places have talent as well. I think it's really a matter of unleashing that talent. We have a lot of things going for us. There's very high-quality research taking place in Canada. The university system across the board is of excellent quality, which isn't necessarily the case in the United States and in other areas.

I think what we're lacking a little bit is the appetite and the incentivization to capitalize on some of these risk-taking opportunities. That's a team sport. That's not just universities. That's universities and government. That's universities and industry. That's universities and the public and the not-for-profit sector as well.

Mr. John Carmichael: I would agree with you on that. I heard that story, just a couple of years ago, on some of the studies this committee has generated, and talking about the valley of death. A lot of the different elements of getting to a place of commercialization is very challenging.

We talk about some of the VC models that are out there. Coming from an entrepreneurial background, I've seen VC models whose risk profiles can be very challenging. I tend to empathize with the concept of how we get that money to the right source. Is it funding more for outcome? I think that's interesting.

Mr. Hervé, you have a business background and now you've stepped into this world of innovation and creativity. Obviously, your energy is self-explanatory. I'm curious what you found coming from a business background, where all of a sudden you've come into this place that's unleashed and the future is just so bright. How do you deal with it every day? What do you do?

Mr. Xavier-Henri Hervé: The first and most important thing that I do is I realize that I don't know. Probably the most important thing that happened to me in that context personally is I realized that I didn't know what I didn't know. We can have a really lengthy conversation about this over a beer one day if you want, but it's a complicated conversation.

To go back to your point about the money, I believe there's an infinite amount of money on the planet in terms of investment money. They're not finding the good enough investment. The reason for this is that there are places like DMZ and places that I've learned to meet, like ours, which are adopting methods, for instance, in project management, simple things such as something called scrumming. There are methods called the lean start-up. There's product marketing. I can go on with the names of the methods. None of these methods are used in big corporations, and when they pretend to use them, they usually have a twisted version of them, very frankly. These are very ground up, base, methods. They're very organic methods. It's just a different way to think.

I have two answers to your question, one of which is we need to do a better job at making these start-ups ready to be invested in. The problem is not the investors. The problem is we don't have companies that are ready to be invested in. The corporate guys, I completely agree, are not helping us to scale this up, because they should be the ones giving customers. The government has a start-up buying program, for God's sake, and none of the corporations do. They don't have a local buying program. Your federal government has a program for buying innovations. No corporations have that. They should be getting half the tax credits when they don't do that and they should get double the tax credits when they do it, for example. It's a simple model. Right now they're getting tax credits not for innovation, but for perpetual product development. I took advantage of it, very frankly, but it's not innovation.

Mr. Vincent Martin: Maybe I could speak to that for just two seconds.

●(1200)

Mr. John Carmichael: Yes, please. I was coming to you next.

Mr. Vincent Martin: I went through the process as well. I came from Silicon Valley, where I started our company, and what was over there that's not here is that environment to get you ready. The minute we were talking about a start-up, all of a sudden we had all these serial entrepreneurs. These people with a lot of experience, who had done this before, were just coming to us. They all want a piece of it, and they all tell you they know how to do it. Some of them certainly did, and some of them didn't, but just the fact that there was a support group there saying, "don't do this; do that", or "talk to this individual", or "go to that group" was worth a lot.

Mr. John Carmichael: Could you give us a snapshot of the cellulosic biofuel project you've been engaged in? Perhaps you could do that briefly, as I know we have time constraints.

Mr. Vincent Martin: It's pretty simple but complicated at the same time. If you look at nature, nature has figured out a way to degrade wood. If we didn't have that, we'd have wood up to our ears and above. It does that in a very slow process. It takes a long time to decay a piece of wood, and when it does that, it doesn't produce anything of value; it produces CO_2.

We know what the organisms, enzymes, and individual parts of that process of degradation are and we can capture them. The problem there is to bring all these pieces together to degrade the cellulose and once you degrade the cellulose to simple sugars, like table sugar, to turn that into a fuel or a chemical.

We know how to do this. Now all we have to do is beat petroleum. It's really an efficiency problem, not a process problem.

Mr. John Carmichael: Is there a marriage of the two, when you talk about petroleum and biofuel?

Mr. Vincent Martin: Yes, there's no doubt about it. I tell this to people all the time. I am part of the BioFuelNet program here that is funded by the federal government. My company, Amyris, went through that, actually. It was a biofuel company to begin with.

Then you realize that all you are trying to do.... The worst business model is to sell your product as cheaply as possible. That's difficult to do, but you have to realize that on your way from a fuel, which is the cheapest thing we can pull out of the ground, to the raw

barrel of petroleum that comes out of the ground, there are all sorts of high-value paths and molecules you can capture on the way over.

This is really what we are doing. We are capturing value as we are going up. As our process gets better and improves, we get to the fuel molecule. We will get there.

Mr. John Carmichael: Thank you.

The Chair: Thank you very much.

One of the things that would serve the committee very well.... You mentioned a model of incentivizing companies by either limiting or not limiting their tax credit, or maybe even amplifying their tax credit based on how many SMEs they get involved in, in their R and D, production, or whatever. It would probably be helpful for the committee if you could submit a brief document in that regard that brings it from concept to a little bit of pragmatism.

[*Translation*]

Ms. Papillon, the floor is yours. You have seven minutes.

[*English*]

Did I get it right?

Ms. Annick Papillon (Québec, NDP): That's great.

[*Translation*]

Thank you, Mr. Chair.

I have here an article that was published in the *Globe and Mail* this week. I feel that it will be very useful for us. The title is:

[*English*]

"Canadians can innovate, but we're not equipped to win". The article states:

> We have a long way to go, however. The University of Toronto's commercialization office states that it is "in a class with the likes of MIT and Stanford." But Stanford has generated $1.3-billion (U.S.) in royalties for itself and the Massachusetts Institute of Technology issued 288 U.S. patents last year alone; U of T generates annual licensed IP income of less than $3-million (Canadian) and averages eight U.S. patents a year. Statistics Canada reports that in 2009, just $10-million was netted by all Canadian universities for their licences and IP. Even when accounting for universities that have open IP policies, this is a trivial amount by global standards.

What could we do to improve our performance versus the U.S. universities?

Mr. Vincent Martin: I need to speak to that, because I lived that. I came out of UC Berkeley, and I can tell you that everybody I worked with and everybody in the laboratories wanted to start a company. They all wanted to be entrepreneurs. Very few of them were actually thinking about being an academic and becoming a university professor.

That's really where it starts. You don't see that very often in academic environments in Canada. As much as I try to replicate that, it's in the culture. It's ingrained in the way they do it.

All you really have to do, and this is how they do it at Stanford, etc., is capture that energy and that desire. As Xavier said, they get him ready, coach him, and then unleash him on VCs, and it just goes crazy. It is just that environment they manage to generate and create. That's the solution.

To me it's in-my-face simple. To recreate that environment in our Canadian institutions, we need places like the Digital Media Zone and District 3.

Dr. Graham Carr: Perhaps I could jump in.

I think we have a challenge in Canadian universities, even in American universities, in the way we train highly qualified personnel researchers at the graduate level. For a long time we've had a default model of training people with advanced degrees on the assumption that they're going to give in to the academy and become professors and researchers. Statistically, only about 20% of Ph.D.s who complete their program are going to end up teaching in a university context.

One of the things we need to do is to begin modifying the training regimen because we need those highly qualified people, but we need them not just in the academy, we need them across the spectrum of economic activities. What we need to be doing in universities is modifying our advanced training programs to show students there are multiple pathways, such as the pathways that could capture the excitement that Vince was talking about at Berkeley.

● (1205)

Mr. Xavier-Henri Hervé: There is a vocabulary, and it's 100% what they just said.

I can tell you the researchers in their brain frame right now see District 3 as a competitive place. Do you know why? Because the graduate students that they want to produce papers are no longer producing papers, but they're staying until 10 o'clock at night in my lab playing with brain computer interface machines. What's the problem here? That's basic, the most core example I can give you. I would go even further than what Graham said. The people who need that exponential technology, when you're talking about microfluidics, which means putting a whole lab on a chip this big, you can't explain this to a corporate guy who is 55 years old. I'm sorry, but he's just not programmed to understand it. You have to let the young guy do it on his own.

The Chair: This is the toughest decision I have to make, but I'm compelled to because we have votes.

Your testimony has been very good. I can tell just by the way my colleagues have been enthused.

We need to go and vote, but if there is anything else that you feel can make a contribution, and I already mentioned the one document that would be great to get from you—

Hon. Mike Lake: Because they've got incredible innovators working in the Digital Media Zone and D3, could you send us the names of the top two from each place who we might be interested in hearing from directly through the witness testimony that we have?

The Chair: Maybe we could squeeze them in as witnesses before we rise for the summer.

Colleagues, thank you very much. Witnesses, please don't feel that the existence of democracy has any bearing on how much we enjoyed your testimonies.

The meeting is adjourned.