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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 49th meeting of the Standing Committee on Industry, Science and Technology. We're continuing our study of disruptive technologies.

Today we're very fortunate to have with us Mr. Andrew Stuart, the president and chief executive officer of Isowater Corporation.

By the way, Mr. Stuart, I understand that we contacted you pretty well at the last minute and you were very gracious, so thank you very much for making an accommodation in your schedule.

We have Pierre-Luc Simard, the vice-president of technology at Mirego Inc. Welcome.

From the National Research Council of Canada, we have Marie D'Iorio, the executive director of the National Institute for Nanotechnology.

We'll go ahead with your opening remarks. We'll begin with Mr. Stuart and go ahead in the order of my introductions, and then we'll go to rounds of questions.

Please go ahead, Mr. Stuart.

Mr. Andrew Stuart (President and Chief Executive Officer, Isowater Corporation): Thank you, Mr. Chairman, and thank you to the committee members for allowing me to address the topic of disruptive technologies.

This is a very familiar subject. My life is focused on disruptive technologies. Today I would like to introduce myself, discuss the current efforts of Isowater Corporation in developing disruptive technology solutions, and provide some remarks regarding the importance of the role of government, including Industry Canada, to create a flourishing ecosystem for disruptive technologies.

First, on my background, I'm a graduate of McGill University and have a master's in applied science from the University of Toronto. In regard to my career, I am a listed inventor on seven patents. I've developed and sold products in five continents based on disruptive technologies, raised nearly $200 million to support the development of private sector capital to support the development of disruptive technologies, and have served on the board of three public companies engaged in technologies like these. I am currently part of the member council of Sustainable Development Technology Canada. As well, I'm on the board of directors of Learning for a Sustainable Future.

Prior to my work at Isowater, I led a team at Stuart Energy Systems to develop and commercialize water electrolysis-based hydrogen fuel systems for hydrogen-fuelled vehicles. This was a disruptive distributed generation approach to fuel supply that supplemented the conventional centralized generation supply of fuels.

Today I speak to you from the perspective of my involvement with another major disruptive technology. Isowater's mission is to change the nature of production and supply of deuterium oxide, probably better known to you as heavy water. Heavy water is the moderator and coolant of certain types of nuclear reactors, such as the CANDU system that we have here in Canada and deployed in various countries around the world.

In the past 50 years, heavy water has been produced in large chemical plants based on energy policy choices of governments and funded directly or indirectly through governments. As a consequence of heavy water being available to make nuclear-generated electricity, non-nuclear uses have emerged. Entities operating in these non-nuclear fields are Isowater's customers. The applications vary from the manufacture of better semiconductors and fibre optic cables to diverse life-science applications, such as new pharmaceuticals that last longer with fewer side effects, non-radioactive tracers for medical tests, and special research chemicals.

The disruptive feature that Isowater brings to the table is a novel, scalable technical approach to the production of heavy water that can be implemented based on private sector demand and private sector funding, instead of reliance on government policies in energy and on government funding.

Isowater's strategy builds on Canadian expertise in heavy water technology. We collaborate closely with Canada's premier science and technology laboratory at Chalk River, now operated by Canadian Nuclear Laboratories as part of the restructuring of Atomic Energy of Canada Limited. Together, we are transferring technology and products made for the nuclear industry into technology and products for the non-nuclear industry.

The Chalk River laboratory is one of Canada's pillars of disruptive technology development. We await with optimism the transformation of Canadian Nuclear Laboratories towards a government-owned and corporately operated, or GOCO, business model. This transformation is expected to start this summer and be completed by the fall.

A key message for this committee is the type of collaboration Isowater has with Canadian Nuclear Laboratories. We're kind of like a canary in a coal mine, as I like to think of this. Isowater's efforts are considered as pioneering and leading the process of the engagement of small and medium-sized businesses with the lab. Key learnings are that patience is required. Business arrangements need to be made in ways that allow private sector capital to be invested, and government programs need to include support of innovative commercialization of the laboratory's know-how and assets.

I urge the standing committee to encourage Industry Canada and its programs to be used to ensure the new private operator expands business opportunities with small and medium-sized businesses. Canada and companies like Isowater need this laboratory and successful collaborations.

● (1110)

Finally, I would like to leave the committee with a few thoughts on an industry, science and technology agenda in Canada and what it will take to make successful Canadian entities operating in Canada thrive for the benefit of Canadians.

Last week I read an article which said:

> America is blessed with an entrepreneurial culture that celebrates not what has been accomplished, but what's next. It has deep and efficient capital markets, the lifeblood of a dynamic economy, and no country has a greater capacity for technological innovation. That's a crucial source of future strength.

I contrast that with what my mother, Mary Alice Stuart, who was an accomplished business lady and an Order of Canada recipient, said to me when I was young, "Americans like to make money; Canadians like to count it". Until that changes, America is destined for greater prosperity than Canada. By reference, I suggest the committee review former BlackBerry chairman Jim Balsillie's May 8, 2015 article in *The Globe and Mail* entitled "Canadians can innovate, but we're not equipped to win". He touches on the U.S. strengths and Canada's weakness with regard to intellectual property, protection, international trade agreements, university-industry collaboration, raising venture capital, and weaknesses in Industry Canada's 2008 report "Compete to Win".

However, I'd also like to add some specific recommendations for pursuit of disruptive technologies. First, keep building the ecosystem in Canada for disruptive technologies. The references above are very helpful starting points for this. Programs like the industrial research assistance program, IRAP, NSERC student programs, scientific research and experimental development tax credits, foundations like Sustainable Development Technology Canada, and the FedDev program are a few of the key Canadian capacity-building tools for disruptive technology.

No company can develop world-class disruptive technology without export markets being the dominant marketplace. Our trade commissioners are a great resource for small and medium-size business. Export Development Canada has made tremendous efforts over the past 20 years to address the needs of small to medium-sized businesses. Their accounts receivable program opened doors for us in markets such as China and the U.S.

Our conventional banks and the BDC need further structural help to address the working capital requirements for businesses with intangible assets developing disruptive technologies.

The highest priority of Industry Canada with regard to disruptive technology should be to ensure the ecosystem for Canadian entities' full life cycle exists in Canada. The good news is that we have many of these in place, but they need help, and the ones not in place need to be put in place. Fortunately, Industry Canada works with other federal ministries such as Finance, Natural Resources Canada, International Trade, as well as the provinces, to form a Canadian strategy.

Capital markets, intellectual property arrangements, universities, industrial partners, and entrepreneurs add to this complete ecosystem that will support disruptive technologies in Canada and their global success for the benefit of Canada and Canadian prosperity.

Thank you.

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

[*Translation*]

Mr. Simard, the floor is yours.

Mr. Pierre-Luc Simard (Vice-President, Technology, Mirego Inc.): Thank you very much, Mr. Chair.

I am pleased to appear before the committee to share with you the expertise that Mirego has developed in defining and developing products for our clients. Mirego's activities are principally in the area of mobility. We create mobile applications for our clients and for their users, both web-based and native.

Mirego's history involves a focus on mobility and its associated products. As a product designer, Mirego is centred on the interests of our clients and their users. Often, it is we who have to find a balance between users seeking to get the most value and simplicity from the way in which the products can be used, and our clients seeking a return on investment, in terms of either finances or involvement. As designers, we, of course, are seeking to create innovative products of the highest possible quality.

Since the arrival of smartphones and their constant connection with the Internet, the way in which people communicate and work has been transformed. It affects the telecommunications industry and is now a feature of other industries. The media have felt the impact on their business models, notably in terms of the changes in how and when their content is consumed. Insurers too have had to change the way in which they accept claims and evaluate risk in order to stay in tune with their clients' new habits in using smartphones.

The constant Internet access that mobile devices make possible is only one facet of the changes they bring. Indeed, a number of other transformations are imminent. Principally, they come as a result of the more recent generations of devices that, comparatively speaking, have more computing capacity than the computers of three or five years ago.

This computing capacity, which is remarkable in such small devices, comes as the result of sensors that allow the capture of a huge amount of data about the environment where the device is located. This involves a new way of gathering data and a greater ability to process the data in real time. For example, access to the GPS data of a large number of mobile devices already allows companies like Google and Apple to look at the traffic on the roads and alert users to various points of congestion. Similarly, a startup company is now trying to use the altimeters in millions of smartphones to measure barometric pressure in many places in real time. This will per se improve meteorological models and result in more accurate forecasts.

In the same way, the accelerometers in smartphones let the owners know about the number of steps they have taken and the total distance they have covered without them having to capture the information or disclose the way in which it is used. By using several sensors simultaneously, a software developer can now deduce a lot of information about the situation in which users find themselves. Some kinds of software, like Google Now on an Android phone, can find out where users have parked their cars without them having recorded that information.

The increasing numbers of sensors that mobile devices can have, directly connected with the device, or via accessories like smart watches, combined with the devices' almost permanent connectivity, has already changed the way in which we conduct our activities and the way in which we gather data. This is about more than the sensors in mobile devices, it is also that they are constantly at our side and are now the repository of very personal information about us.

In the past year, new information about the lifestyle and the health of users has become available to application developers. This information, which is only available to the applications if the users permit it, is very personal indeed. It is also extremely valuable for a number of industries. We need only think about medical research, which, through the applications, can now access a good number of health indicators, including how treatments are being followed.

Data such as heart rate, blood pressure, the level and intensity of physical activity were previously difficult to gather and required the user to take notes and report the data over long periods of time. Today, that data can be gathered almost automatically, or by using reminders. The data can be transmitted to researchers almost instantaneously. It can be shown that, in recent months, it has been possible to conduct medical studies using smartphones by working with research centres in the United States and publishing in *ResearchKit.*

● (1115)

Mobile devices at the centre of information collection can not only move research forward by collecting more specific data more often, but they can also permit daily monitoring of patients and their treatment protocols.

It is well understood that, to achieve that kind of transformation, private information must be shared. With time, we are seeing that sharing sensitive information between services and users is becoming more and more acceptable for the latter. A Gallup poll in the United States shows clearly, however, that members of generation Y still expect the information they are sharing to be private, despite the various leaks of confidential information that have occurred in the media in recent years. It goes without saying that it is in the interests of designers and service operators to keep the data confidential and, at the same time, to provide users with the greatest value possible for the data with which they are entrusted.

The fact that the general public has access to such highly developed mobile devices makes for business models that were impossible until very recently. For example, if the customers of a car insurance company have smartphones, the company can measure the quality of their driving and more precisely evaluate their risk levels without having to spy on them or to use tests to evaluate their driving. The insurer's production costs are greatly reduced as a result. In return for sharing the data, the customers can get a rate that more fairly reflects their driving.

The real and transformational changes that mobility can bring with it require a greater tolerance for risk and an ability to see beyond the novelty effect. In the same way as office computers transformed our way of working at all levels, the ubiquity of mobile devices will bring major changes. As a result, we must give innovating companies the manoeuvring room they need in order to explore and perfect new ideas and to experiment with new products. This must all be done by protecting them from regulatory and business decisions that are motivated by the fear of change, by a lack of tolerance for risk, or by pressure exerted by those who are affected by the change.

At Mirego, we work with clients who are looking to bring about profound changes. That requires us to be visionaries. Daring to innovate, or even to reinvent what already exists, in order to provide a remarkable improvement that can change people's lives requires experimentation, research and a great deal of creativity. These technologies allow us to do just that; we believe that we have only just begun.

Mr. Chair, thank you for inviting me to testify before the committee today.

● (1120)

The Chair: Thank you, Mr. Simard.

[*English*]

We'll go to Marie D'Iorio, please.

Ms. Marie D'Iorio (Executive Director, National Institute for Nanotechnology, National Research Council of Canada): Good morning, and thank you for the invitation to testify as a witness.

My name is Marie D'Iorio, and I'm the executive director of the National Institute for Nanotechnology, NINT for short, based in Edmonton. It is a partnership between the National Research Council and the University of Alberta, and it is funded by both the federal and the provincial governments. It was established in 2002 as one of NRC's cluster initiatives. The state-of-the-art facility opened its door on the campus of the University of Alberta in 2006.

● (1125)

[*Translation*]

The NINT strategy is based on a collaboration that transforms discoveries made in a university setting into technologies that can be integrated into potential products for the market. This is done by combining the creativity of university researchers with the expertise and discipline of NRC researchers who focus on integration, manufacturing and the cost-to-performance ratios of the materials and the devices on which they are working

NINT works in an interdisciplinary way to develop materials and devices with the potential of leading to differential or disruptive technologies in electronics, energy and medicine.

[*English*]

As was observed by Dan Wayner, vice-president of emerging technologies at NRC, at the committee's May 7 meeting, the term “disruptive technology” refers to a profound or discontinuous change in capability or cost-performance ratio with significant economic and social impacts. Sometimes this happens through technology integration or technology remix. It is the deployment in the marketplace that is disruptive, rather than the technology itself.

In order for Canada to be competitive in the development and deployment of disruptive technologies, there must be collaboration across innovation systems. By that I mean the universities, the research technology organizations, government regulators, and industry. No single entity can do it all.

Collaboration is a necessary but insufficient condition for success. It also requires vision combined with deep subject expertise, a high tolerance for risk, patient investment, and acceptance, if not the embrace, of failure. These are tied of course to risk-taking fortitude and entrepreneurial spirit on the part of people doing that work.

[*Translation*]

I would like to provide a few examples of disruptive technologies, starting first of all with the work underway at NINT.

For more than 20 years, the NRC has been investing in nanoelectronics, because, with current computers, miniaturization and the cost-to-performance ratio have reached their limit.

How do we meet that challenge? One of our researchers, Professor Bob Wolkow, has developed the knowledge to build a computer that is extremely fast. It operates at room temperature and uses very little power. It is a revolutionary concept because no other architecture meets all of those criteria.

[*English*]

Have the conditions for the development of disruptive technology been met? If we look at collaboration, for example, the NRC, the University of Alberta, NSERC, the Government of Alberta, and Lockheed Martin support the research and the development of technologies to demonstrate this type of computer.

In terms of vision, universities, research technology organizations such as NRC, and industry have recognized that quantum computing is part of the world's future and can generate wealth for Canada.

In terms of risk tolerance, there are still many obstacles to overcome in order to get a manufacturable computer of that type, and others may win the race, but in so doing, we will be learning a lot, and that will help us with the next race.

As for patient investment, it has been more than 10 years in the making, so yes, we are patient, and we have to continue being patient so that we can get to the goal.

Professor Wolkow has spun off a company called Quantum Silicon Inc. He has attracted $2.5 million of seed funding to carry on with the technology demonstration. It is part of the story of Canada's leadership in the field of quantum computing worldwide.

[*Translation*]

Before joining NINT in Edmonton, I directed the Institute for Microstructural Sciences in Ottawa, which now comes under the NRC's information and communications technology portfolio.

One of the best examples of disruptive technologies in this area is in optic communications. In 1987, a researcher was able to convince the management team of the day that an emerging technology in the United States should be developed in Canada. He said that the technology would replace information-carrying cables in a network by light, the various wavelengths of which would carry the information. By dividing light into its different wavelengths, it would be possible to send more information in parallel and thereby increase the speed and the capacity of the networks.

[*English*]

While this seemed a wild idea in 1987, its realization would increase data transmission by more than 100 times and diminish issues of signal strength over long distances. Given that foresight, what convinced NRC to take the risk and invest in the optical communications race?

The management team had the breadth of knowledge and the scientific judgment to understand that Canada's excellence in material science and photonics was a competitive advantage in that race. They reduced the risk by forming a consortium to build the technology and bring the technology to market, ensuring that the members of the consortium would have full access to the intellectual property once the technology was developed. They also introduced the rigour of project management to focus the effort of the technical team on the delivery against milestones.

That consortium of Canadian companies, universities, NRC, and NSERC focused the efforts of part of the personnel of the institute at the time on developing what was called wavelength division multiplexing. While the nature of the work to be undertaken was clearly pre-competitive in nature, a technology demonstration outcome was chosen from the outset. It was to be the precursor to developing photonic integrated circuits for optical telecommunication.

The work of the consortium was funded for seven years. It led to the creation of many Canadian spinoffs—four from NRC—the rise of Nortel, and the capture of 40% of the optical communications market by Canadian companies by the year 2000. By 2010 the return on investment from this disruptive technology was 400:1 in Canada alone.

Another example of the role of government in the disruptive technology space is the support of companies when they are ready to demonstrate their technology and they need low-volume manufacturing and packaging capabilities in Canada. This story is actually a continuation of the previous one. After the success of the Solid State Optoelectronic Consortium, as it was known, the same visionaries reflected on what was required to help Canadian companies be competitive and generate wealth in Canada.

At the time, many Canadian spinoffs were failing because they could not afford to maintain state-of-the-art facilities to demonstrate their technologies. The concept supporting the potentially disruptive technologies was one of a photonic fabrication centre that could support companies with a design and low-volume manufacturing of photonic devices like lasers and so on. It was funded in 2002. The Canadian Photonics Fabrication Centre was, at the time, one of very few worldwide. It attracted clients from around the world, and some of them actually established a presence in Canada in order to benefit from this fabrication centre. A few years later, the majority of the clients of the CPFC were Canadian. By 2010 the return on investment of the CPFC was 10:1, so it obviously addressed a need of the companies.

● (1130)

[*Translation*]

I would like to conclude by emphasizing that Canada is well placed to support the development and deployment of disruptive technologies if it encourages collaboration, vision, risk-taking, long-term investment and the acceptance of failure as an integral part of the innovation system. Failure is part of learning, but it also allows us to gauge whether there really are risks to be taken rather than relying on sure bets. A culture of entrepreneurship in an ecosystem formed around innovation must accept failure so that success can be so much more rewarding.

Thank you.

The Chair: Thank you, Ms. D'Iorio.

[*English*]

Now to Mr. Carmichael for eight minutes.

Mr. John Carmichael (Don Valley West, CPC): Thank you to our witnesses for taking time to join us today.

Mr. Stuart, you quoted Mr. Balsillie saying that Canadians can innovate, but we're not equipped to win. Clearly, the three of you being here today is demonstration that we are looking for answers on how to equip to win, so I thank you for being here. I hope you've had a chance to read through some of the previous testimony of witnesses who have appeared. We've received some very thoughtful, creative, and I think very helpful information from previous witnesses in terms of trying to achieve that very goal. Equipping to win is without question what we need to accomplish as we go forward.

Mr. Stuart, I'll start with you. I appreciated your testimony on Isowater and some of the issues. You talked about moving from the nuclear to the non-nuclear market, the fast pace of change obviously in technology today, and the highly competitive nature of industry, which demonstrate that there's a need for continual product enhancement. That's obviously what you are working on.

I wonder if you could give us a bit of an overview of your firm's plan in terms of maintaining your leading edge in the nuclear sector. How are you meeting your challenges as you face the non-nuclear sector, and what advice could you give industry and us, as government, in this regard?

Mr. Andrew Stuart: Thank you for that question.

We're maintaining our lead on the nuclear side by focusing on the non-nuclear, somewhat paradoxically. What provides us opportunity in the non-nuclear sector is you have a diverse array of customers, and in our particular area with deuterium oxide or heavy water, they're so unconnected, from semiconductors to pharmaceuticals, it provides the ingredients of being able to move with market pull from multiple diverse users of small to medium quantities of heavy water. The challenge on the nuclear side is that you've only got one, two, or three giant users who need everything or nothing. We can bridge the supply and demand by working with the non-nuclear sector, doing smaller quantities, and we can scale up with them.

We have a wonderful program with Canadian Nuclear Laboratories. It's a three-stage program where we're marketing some of the surplus inventory of heavy water that the Government of Canada owns into the non-nuclear market, developing the customer relationships. We're also working with Canadian Nuclear Laboratories to develop a refinery or a recycling tool at the Chalk River laboratories, where we'll be working with our customers in the non-nuclear sectors who use the heavy water, downgrade it isotopically and then can provide it back to us to upgrade back to the high purity they need for their process.

We extend the life of the finite inventory. We advance the technology for enrichment or production of heavy water with very modern technology. Finally, we're building the pathway, or the bridge, to private sector market pull saying, "I need 10 tonnes here; I need 12 tonnes here; I need 3 tonnes there", who can create the financing conditions to allow the private sector to raise the capital and invest in a scalable production technology to take natural water and enrich that to the very high purity of deuterium oxide or heavy water, the deuterium component of natural water.

It's a three-step project. It's a really wonderful way of looking at how a private sector entrepreneurial firm can work with a government entity, which is now being transformed to this private sector operator entity. Really what we need is to make sure that the private sector operator at AECL doesn't close doors, that it opens them.

● (1135)

Mr. John Carmichael: If you wouldn't mind, let's talk about disruptive technology within that thought process. What are you doing that is disruptive to an industry that exists?

Mr. Andrew Stuart: Fundamentally, the supply of heavy water is going to disappear, and there won't be new supply unless someone does something about it. We're using these new markets and new technology advancements, together with Canadian Nuclear Laboratories, to create private sector production in a very novel manner that's never been made this way anywhere in the world before.

Mr. John Carmichael: Great, thank you.

Mr. Simard, I appreciate your testimony on the bridge. I don't know if your company is taking Mr. Stuart's mother's advice as far as counting our profitability is concerned. It doesn't sound like it. Even though you're in the top 500 profitable companies, I don't think you're taking that advice.

I wonder if you could talk about, when it comes to disruptive technologies, what areas you see Canada as having strength today, and where the private sector, government, and academic institutions should focus their efforts.

Mr. Pierre-Luc Simard: There's a kind of twofold answer to that question. Where does Canada stand insofar as disruptive technology is concerned? We work with a number of partners in different industries, such as insurance, media, and so forth. What we've been able to see is a very clear opening from the academic side on creating research and working with industry in creating new ways of bringing services to customers. The problem we're seeing is the financing of the research has been either hard to do or very small in scale. We think Canada has tremendous research opportunities and very high academic levels, but the bridge between that industry and a group like ours that can work to the end customers needs to be facilitated a bit more. Perhaps that answers your question.

Mr. John Carmichael: When you talk about the financing needs, from the perspective of innovation and creativity through to commercialization, is it the gap that's the problem for you as well?

Mr. Pierre-Luc Simard: Yes, it is. We see very good research happening on the academic side, but the biggest gap is not being able to transfer that through industry and our not being able to take research that's been done and apply it to different industries afterwards.

● (1140)

Mr. John Carmichael: As a country, where do you see our strengths in the industry today? Are we doing anything right?

Mr. Pierre-Luc Simard: The investment, I can see more from the Quebec side where we are based is, the investments being done in university, in specifically computer science and software, have been noted. We're seeing a big improvement in the quality and the grade of the students that are coming out. It is a big improvement and we're looking forward to that continuing in that we seem to be investing a lot in more hardware research. If we make the BlackBerry analogy, we're good at making phones, but we're also very good at making the software that goes in them. I think being able to invest in the software layer of the solution is one of the places where we can make a difference.

The Chair: Thank you, Mr. Simard and Mr. Carmichael.

[*Translation*]

Ms. Papillon now has the floor for eight minutes.

Ms. Annick Papillon (Québec, NDP): Thank you, Mr. Chair.

It is a pleasure to welcome a Quebec company to Ottawa. Thank you for coming to meet with us, Mr. Simard. I have a few questions for you.

In describing your company's vision, your website says:

> Technologies become useless, capital dwindles and competitive advantages slowly disappear, but the right people will always allow an organization to excel, reinvent itself and survive change. Instead of putting a spoke in their wheels, we think businesses should offer people the freedom and the environment to enable them to reach their full potential.

Are Canadian companies a little too conservative when it comes to reinventing themselves? If so, what is the mindshift we need to happen here?

Mr. Pierre-Luc Simard: Not all Canadian businesses are conservative. There is an increasing openness to change, first because it meets a need. One effort I can applaud is the one by our partner, *La Presse*, which was able to reinvent how the newspaper is made. There was obviously a business need there. The newspaper's managers were able to finance the risk using their own money, which is not necessarily the case for all Canadian companies.

It isn't necessarily a lack of vision, but it is sometimes more a lack of means that prevents businesses from taking the risk of failing, as we said, to finally finding the recipe that will allow them to reinvent themselves. But it's often difficult to take this risk.

Ms. Annick Papillon: What are the main obstacles that a company like yours might face when it's trying to implement new technologies?

Mr. Pierre-Luc Simard: Implementing new technologies in part involves change management. The entire organization must be a stakeholder in this change. It often affects more than one individual because it touches an entire group of workers. The difficulty often lies in human resources management rather than in the technological aspect of the change.

A number of technologies can add a lot, but the individuals must also be willing to change the way they do things. There are a few examples of that. In journalism, access to the product and the content have to be changed. For information media, how the rights are attributed needs to be changed somewhat. In medicine, the way people work with confidential information must be changed.

Often, the way things are done prevents things from moving forward, more often than the rules or individuals.

Ms. Annick Papillon: If you could ask the federal government to adopt a single measure to help your business excel in new technologies and innovation, what would it be?

Mr. Pierre-Luc Simard: It would be to increase funding for research and development and to promote it. Often, we have an idea, but we have to be willing to run a risk. This funding would enable businesses to agree to fund the risk. They would do it in partnership with the government.

Ms. Annick Papillon: I would also like to address the issue of the growing number of business incubators in the area of new technologies. What do you think are the positive and negative aspects of that kind of development?

Mr. Pierre-Luc Simard: Business incubators make it possible to fail fast, fail often.

I'm sorry for paraphrasing. These incubators allow for that to happen. It involves trying an idea, holding meetings and discussing with other people who are also innovating to come up with promising ideas that will produce a change. These incubators make it possible to try these things out at a very acceptable risk level. You don't have to mortgage your life to test out an idea and start a business.

● (1145)

Ms. Annick Papillon: That's the most positive aspect, but is there a negative one in your opinion?

Mr. Pierre-Luc Simard: The negative aspect is creating a microcosm of people who may think the same thing. If you don't take care to inject new talent or slightly change the business' direction, the risk is that everyone will see the problem the same way. Somewhere, you have to step back to be able to resolve it differently. The discussion about incubators may focus on a vision that is too similar among the various participants.

Ms. Annick Papillon: There may be a lack of diversity of opinions.

I would like to ask another question. Knowing that Canada lags a little bit behind when it comes to investment in research and innovation, are we going to be able to surf the wave of new technologies in the coming years? If not, will Canada be able to compete internationally? Canada is the only developed country that has a deficit when it comes to intellectual property. That means that we are spending more to acquire the technology of other countries that what the rest of the world buys from us. How do you think we could fix that situation?

Mr. Pierre-Luc Simard: It's a little like what I said earlier. We need to develop the capacity to make a link between the research that is already being done in our universities and the industry, and make sure we increase this link. Activating it is already a very good thing but we also need to build this bridge. We often have many excellent research ideas, but realizing them is still difficult.

We need to build this bridge. If we look at what is happening in the United States, we can see that there are a lot more direct bridges between business and the the research sector, which makes it possible to quickly test a cutting-edge idea on the market. It's more difficult to do in Canada. We don't lack ideas, but we probably don't have the means to implement them.

Ms. Annick Papillon: That's right.

Since this is an opportunity to speak to a representative from a Quebec company, I was wondering whether I could give you the last word so that you could talk about certain aspects that we haven't had an opportunity to discuss. What should we do for Quebec companies in particular?

Mr. Pierre-Luc Simard: Quebec companies are still privileged. Specifically, the City of Quebec offers a lot of ways for companies to develop. I couldn't tell you any more than that.

Ms. Annick Papillon: Before the election, is there anything we should focus more on? Yesterday, I commented on our mayor's shopping list. How can we help more in this respect?

Mr. Pierre-Luc Simard: I'm not really the best person to answer that question.

Ms. Annick Papillon: Thank you for your testimony today.

The Chair: Thank you, Ms. Papillon.

[*English*]

Mr. Lake for eight minutes.

Hon. Mike Lake (Edmonton—Mill Woods—Beaumont, CPC): Thank you, Mr. Chair.

I found that to be an interesting line of questioning. I wrote down a direct quote from Ms. Papillon, who said that Canada is the only developed country in the world that is lagging behind in technology. I never heard that; there's no stat to back that up. I'm not sure what that even means, and Canada is certainly not investing less in R and D. In fact, in the G-7 we have the strongest investments in R and D. It happens that the Canadian business community isn't investing at the same rate, and it's a challenge to get Canadian business to invest in R and D. Certainly the government has a role in creating policy that encourages Canadian business to also invest, but with investments like the Canada first research excellence fund, which is $1.5 billion, we're leading the way, and when you talk to the universities and colleges across this country they recognize that.

Marie, in talking about the Canada first research excellence fund, one of the things we talk about is the idea of an area where Canada is near the top in terms of innovation, in terms of world leadership in a certain area, and taking Canadian researchers to the top, to that world-leading position. It seems to me that as I sit and observe the different areas of opportunity, one of those areas is in nanotech. When I see what's happening at the U of A right now in nanotech, it's pretty remarkable.

I'm going to bridge that to an area of challenge in policy in Canada. That would be pipelines and moving oil and gas, for example. That's a huge opportunity for us as a country if we can figure out ways to do that safely, but of concern to people across Canada is making sure it's safe. Maybe you could talk a little bit about the applications of nanotechnology in that specific environment, because I know there's some great work happening in the Edmonton area in terms of those types of developments.

● (1150)

Ms. Marie D'Iorio: There is indeed a lot of work that's being done in the oil and gas area at the University of Alberta and at NINT as well.

One of the advantages of nanotechnology is that the materials at that scale offer new properties. That's because you have more and more access to surface area, and it means that if you include nanomaterials in existing materials there, they have a higher performance. If we think, for example, about lubricants, if you use nanomaterials in lubricants, they work at different temperatures, have better properties, and so on. That's important for the oil and gas industry.

We work on other problems that are related to the use of equipment in drilling, for example, and the fact that you have equipment that uses batteries in conditions of very high temperatures. Most batteries that we use now do not sustain the very high temperatures that are used in drilling rigs, so how can we use nanotechnology to increase the performance of batteries? We're working on materials for new types of batteries for the oil and gas companies.

These are only two examples, but again it's a type of technology where you have access now to different properties and that's what we try to go and fetch. Nanotechnology is not an industrial sector. It's actually an enabling technology that has applications in all industrial sectors. You just have to choose which sector that you want to have an impact in.

Hon. Mike Lake: It's amazing because when you think nanotechnology, you think computers and really small computers, but of course if you visit the Edmonton Research Park, you'll see pipelines, big pipes that they're testing. They can bend them like a cardboard paper towel roll bends without breaking, because the material inside is designed so incredibly that it doesn't break the bond kind of thing, and it doesn't compromise.... It's something that we've never seen before. There are sensors that they can put in these pipes to detect even the smallest vibration. It's just phenomenal.

Ms. Marie D'Iorio: That's correct. You have access to coatings, for example, in pipelines or anything else, and also to environmental sensors that can be distributed and can report back information as to whether there is a leak, for example, in a particular remote area.

Hon. Mike Lake: Nanotechnology can have impacts on some pretty big things.

Pierre-Luc, your testimony was really interesting. I don't really know what your organization does. Perhaps you could take a few minutes and give us a really practical example, as if you were trying to explain to Canadians who might read the transcript, of what types of disruptive technologies your company is involved in, and where you're going as a company. The notes sound like you've been tremendously successful. I want to hear a little more about what you do.

Mr. Pierre-Luc Simard: Mirego is essentially a service company. We work both at defining products and at making those products. We're sort of an engineering-heavy company. Out of 65 on our team, we have about 40 engineers. The rest of the team is on design and the creation of digital products.

We work with a number of industries. We have a number of clients in the insurance industry. We work with them at redefining different processes whereby we can bring them either faster processing or better interactions with their clients.

One of our success stories was working with *La Presse+* in a process that was a redefining of the newspaper in a digital form. Recently, we worked with Bell Canada on Bell Fibe, actually, their new platform for delivering content for over-the-top and over mobile devices for Bell Fibe customers.

We come in and work with our clients at defining what is the user experience they're trying to bring in and what is the problem they're trying to solve, and then at defining a product that's based around that.

● (1155)

Hon. Mike Lake: I had the opportunity in Montreal recently and in Toronto to meet with the universities and see their incubators and the different things that are going on. I think it's D3 at Concordia, for example. To what extent do you work with those universities to synergize, in a sense, to grow what you already have, and to grow the capacity within the universities?

Mr. Pierre-Luc Simard: We rarely get the chance to work directly with universities. In our case, usually what will happen is.... I'll use the example of an insurance company going to a research lab within the university. They're already working with a partnership and finding algorithms to define how you could, for example, define the driving skills of one of their clients. Then, in bringing it to us, it's about how we can make this a rich user experience, how we can take that research and make it an actual product. That would be an example of where we work with universities, but not directly with incubators.

We work with start-ups, not necessarily out of universities, but either privately funded start-ups or self-funded start-ups, where we essentially are their engineering force to bring their product to market in the first version. We work with them both at creating inside their company a force that will be able to maintain that product and also at being there for extra capacity and for moving to faster delivery of new features, for example.

The Chair: Thank you.

Now we'll go on to Madam Sgro for eight minutes.

Hon. Judy Sgro (York West, Lib.): Welcome. It continues to be an amazingly interesting study, and it's fascinating to hear from all three of you.

I will start with Mr. Simard, and continue on.

How long have you been in business? How did you get to the point where you are one of the top 500 companies or in that range? Would you give us some background on how you arrived at where you are today? Then I would like to know what kind of roadblocks were in your way to achieving the success you have today.

Mr. Pierre-Luc Simard: We were founded at the end of 2007. The bulk of our growth has been organic, simply through references. To this day, we actually don't have a sales department. Most of our growth has been through word of mouth and through creating very good products for our customers, who then refer other customers to us. To this stage, that's how we've been growing.

We are starting to find ways to expand throughout Canada and getting known to a wider audience. We've been very present in Quebec, but less so in English Canada, in Ontario and so on. Really, that's where we're looking as far as expansion and growth go.

I just want to make sure: does that answer your question?

Hon. Judy Sgro: You said you started in 2007, so prior to 2007 what were you doing?

Mr. Pierre-Luc Simard: Prior to 2007 I myself had been in a different number of positions. I worked at multiple start-ups, a couple of them in the medical field and one of them in digital signage. I also spent about five years in the energy industry, working for what was known then as Cooper Power Systems. It's an American company that acquired a Quebec company called Cybectec originally. I spent five years there somewhat as a product end client liaison agent.

Hon. Judy Sgro: What are some recommendations that you could provide to help us facilitate this ever-changing landscape to make your business and businesses like yours continue to be competitive and successful? Do you have any advice for us as MPs sitting at a table who are very interested in knowing what we can do to help you and others like you succeed?

● (1200)

Mr. Pierre-Luc Simard: There are really two aspects to it. The first one—

Hon. Judy Sgro: —is stay out of the way.

Mr. Pierre-Luc Simard: Well, yes.

Voices: Oh, oh!

Mr. Pierre-Luc Simard: That is part of my comment.

Our true comment is that often the problem we find in innovation is that we're redefining something that's either not defined or that exists in physical form and that we try to make digital, and the same rules don't apply. Copyright is a big example of that.

The other aspect is giving the means for us and our clients to be able to innovate, being able to take risks and share in the success and to be there to support our clients and us in cases when we fail. It hasn't happened yet, but you never know.

Those are really the things we're looking at.

Hon. Judy Sgro: Mr. Stuart, it's the same idea. What can we do as MPs to help you in your success and help you to further growth in Canada and employment as well?

Mr. Andrew Stuart: There are two areas there, in general terms, as I discussed today. This ecosystem for entrepreneurial businesses, particularly those focused on disruptive technologies, which take time to commercialize and must have eyes on a global market, cannot just look at domestic markets. But we want in Canada to have prosperity, so we have a role for government to ensure all these things. It really is very important to be cross-departmental. We need EDC, which I believe is under Finance. We need, of course, the Department of Industry. We also need International Trade.

We need to cooperate with the provinces in their programs. We need to have intellectual property arrangements that are right. We need entrepreneurs to have incentives to be able to take risks.

We need to cherish failure. We can't be so afraid of failure that we can't take any risks because it might fail. If some things don't fail, then we're not pushing the edge enough. We need to embrace this.

We need to recognize that we're not America. In a way our biggest risk, I feel, is that Canada in the eyes of America can be simply seen as off-balance-sheet research and development. All our great programs and things that we worked so hard in Canada to bring forward are off-balance-sheet research. The capital will come in and take the idea away and then it's on balance sheet, but partially or all out of Canada. We need to recognize that and we need successes in Canada to refill the coffers of successes.

In my particular case with my company, we're focused very much on the evolution of Atomic Energy of Canada Limited, going through Canadian Nuclear Laboratories as a transition to a government-owned but corporately operated enterprise. The ability for Industry Canada and these other programs and for the Chalk River laboratories to be part of this ecosystem is a tremendous opportunity for Canada and Canadian firms. It's particularly dear to our heart and soul to succeed.

That means we need to have patience and support and the encouragement of processes to move technology and know-how out from Canadian Nuclear Laboratories into the markets, both nuclear and non-nuclear. It's Canada's best research and development organization, with 3,000 scientists and engineers. If we don't champion this in a way that can benefit all Canadians, we'll really miss something in Canada. It's just a rock-solid base and a pillar, as I said, of disruptive technology.

Hon. Judy Sgro: What kind of support are you getting currently?

Mr. Andrew Stuart: In the last three years, I think we kind of.... About five years ago we started our collaboration with Atomic Energy of Canada. There was before the restructuring, and then there's now during the restructuring. The restructuring has supported us in the type of thing we're doing. Instead of Natural Resources Canada funnelling money straight down to the AECL structure to support commercial operations of CANDU reactors, it's still supporting CANDU but we're bringing real money in to the sides, going back up, and reducing the burden. If things change and we're cut off from access to this through this transformation, then we're in jeopardy. As I say, we're kind of like the canary in the coal mine, in that sense.

I remember meeting with the President of the Treasury Board a few years ago. I explained to Minister Clement that I'm here to try to put money into the treasury, not to take it out, and to really get funds into Atomic Energy of Canada, reducing the burden on Natural Resources Canada, because there's so much depth in technology and expertise at Chalk River. That is a real asset to Canada. We need to convert that into basically the pillar of disruptive technology in Canada and make sure that all our programs, such as Industry Canada's, are there to support enterprises like ours, and that rules are set up that we can still approach them after the transition.

● (1205)

Hon. Judy Sgro: That's very exciting.

The Chair: Thank you very much, Madam Sgro.

Hon. Judy Sgro: Ms. D'Iorio, I'm sorry I didn't get a chance to talk to you.

The Chair: Mr. Warawa, you have eight minutes.

Mr. Mark Warawa (Langley, CPC): Thank you to the witnesses for being here.

I'd like to focus on energy. A couple of you have mentioned energy. I think Mr. Stuart talked about hydrogen fuels in the past. That has its applications, but in the vision, it maybe did not transform industry to the extent that the vision suggested it might. It has some very good applications now that are being used.

With regard to battery storage and moving to electric vehicles, how do you see...? Mr. Stuart touched on what's next and thinking out of the box. Where do you see transformative technologies that become disruptive when they actually are put to use? Where do you see us going? What's next in energy and waste management?

Any of you, what are your comments?

Mr. Andrew Stuart: Would you like to go first?

Ms. Marie D'Iorio: We work not only with the energy sector as it exists now, but also in thinking about other sources of alternative energy. It goes hand in hand with things that take a long time to develop, which may be there as alternatives co-existing with the energy sources we now have.

There is a very large opportunity in the area of biomaterials. The sort of research we do in nanotechnology is intimately linked with materials. As we look at materials, we ask how we can do a better job at mimicking nature and how we can use biomaterials, materials that are designed so that they work like biological materials. Biomaterials often have the advantage of being degradable and they're not toxic. It's an opportunity for Canada, which is rich in resources, to help the forestry industry for example, and the materials there. Among the materials in nanotechnology, we worry about nanocrystalline cellulose. How is that a new material? How is it going to affect medicine? Could we use it as a material in automotive and aerospace applications, and so on? It's a new material system that can help sectors in which Canada does very well.

As I said, we take the approach of looking at materials from a perspective of toxicity, degradability, environmental impact, and the life cycle of the materials. In many of the comments that were made, I think social licence to use....

With disruptive technologies we also have to think about the impact on our society and whether it is something we wish to have in our future. We've had to address that with nanotechnology because as we decrease the scale to the atomic scale, the same material could be non-toxic at large scales and become toxic at certain scales. We have to understand the toxicity aspect. We have to understand whether this is something we want in our environment. If I make a device, if I make a new sensor, what's the impact on the environment when it degrades in the eco-centre?

With disruptive technologies also come these other aspects. From Industry Canada's perspective, it means a collaboration between NSERC, SSHRC, and CIHR. Often disruptive technologies leverage different disciplines. There are engineers working with biologists, physicists, chemists and social scientists. That's the approach for disruptive technologies, so that, for a very good technology, we won't get to the end point and say that we'll never get acceptance for that and we should have worried about that from the very start. That I think is an aspect of disruptive technologies that we have to support.

● (1210)

Mr. Andrew Stuart: To add to that I'd like to quickly reference a book by the Canadian Academy of Engineering called *Canada: Becoming a Sustainable Energy Powerhouse*. It discussed nine big ideas, projects that Canada should pursue with mission-oriented leadership. In the 1950s and 1960s Canada would take on one such project a year. Now it seems we try to cancel one project per year.

I think the way these large projects connect to the very small elements of disruptive technologies is today large projects, be it a pipeline, an oil sands, power in the Northwest Territories or power in Newfoundland, these projects often will use components that are disruptive technologies, and they will help create sustainable large-scale projects. Many of these are in the energy sector. I think Canada also needs to look at big projects where disruptive technologies can be a part, and this will help us.

Going back to hydrogen and things like that and what's next, the role of hydrogen is now very well defined, much more than it was 15 or 20 years ago, both in understanding where gasoline hybrid electric technology can get us, and where pure battery electric can go. There's a very clear path now where hydrogen fuel cells or internal combustion engines can really make a difference.

It will decarbonize the car. If decarbonizing must go ahead, it will allow that to be done on the ground where fuel is being produced, and it will make practical vehicles that get refilled in a few minutes and have a range similar to that of a gasoline car.

I think that role for mass transportation for hydrogen vehicles is clear. As you said, there are many other very higher value-added applications for hydrogen technologies today, and I'm really excited about that.

I'm not involved in the field directly today, but I'm more optimistic than I've been in 15 years in the innovative capacity of Canada, that the cost of the technologies, the development in the marketplace has moved so far forward from 15 years ago when my previous business was developing innovative ways to fuel vehicles in your driveway, or at the bus depot in Vancouver, or whatever.

This stuff is now certified, endorsed by so many large corporations, and once a week or once a month one of the major car companies releases all their patents on such technologies, in other words to create the ecosystem again of sufficient parts suppliers getting mass-scale production, and bringing them down.

I think Canada should revisit its hydrogen focus that we had many years ago—it petered out—because I think right now these value-added applications you're talking about are going forward in the short term, but I also see the hydrogen car coming forward irreversibly, and I think Canada's very well positioned to exploit that and be a leader.

The Chair: Thank you, Mr. Stuart and Mr. Warawa.

Now we'll move to Ms. Nash, for eight minutes.

Ms. Peggy Nash (Parkdale—High Park, NDP): Thank you to our witnesses for being here today.

I'd like to pick up on something you raised earlier, Mr. Stuart. You talked about that opinion piece written by Mr. Balsillie a while back in *The Globe and Mail*. He talked about Canada not getting its innovation infrastructure right. He talked a lot about IP, and he made a number of recommendations. One of them was for sovereign patent pools to help SMEs especially and that Canada had fallen behind other jurisdictions on this.

In your experience, would that be helpful, or is it something you have felt has been lacking and Canada should address?

● (1215)

Mr. Andrew Stuart: Mr. Balsillie is extremely knowledgeable, and that's why referencing his article covers a great deal of scope within a very few moments. I think I would take everything he says quite seriously.

I found the patent issues really interesting and how trade agreements are set up. The Americans have it together. They really understand how to corner the industries, how to make things to benefit Americans. We need to examine how we can counter that to the extent we can, recognizing they are very powerful and they have a lead on this collaborative thinking of how to make their industry strong.

As I pointed out, I think that would be one of the ecosystem ingredients that we really need to get together on to make a great success of our country.

Ms. Peggy Nash: Several witnesses have talked about the importance of post-secondary education, of investing in innovation, making moneys available. Mr. Balsillie, in his article, quoted an American at a conference he was attending who said, “I don't worry about small innovators.” It's as though the lead time, all of the risk, is being taken here or in another country, but when they get to a certain size, that's when they move in and purchase.

How do we, in your experience, foster a situation where if we are investing as we are in post-secondary education, we are investing in innovation, and as many witnesses including yourselves have said, failure is a big part of this.... If you're taking the risk both publicly and privately, how do we better reap the rewards and not have a situation where those start-ups get grabbed by the bigger fish, usually in another country? Do you have any thoughts on that?

Mr. Andrew Stuart: Yes. It's a very good point and it's absolutely what I referred to earlier. To America we are off-balance-sheet R and D, and when it looks good then we become on their balance sheet and many of us move to the United States. I think this is a really important thing to address. I'm not the first person to say that. It's been something we've talked about in Canada for many decades and I think there's a....

I go to Boston quite a bit in my business now into the life science industry, and I just find it amazing, the contrast. I live in the Collingwood area on a farm and when I drive to Toronto, I always come into Toronto and I see all these warehouses and these trains with Chinese-delivered cargo going into distribution centres for consumption. I don't see industry in the surroundings of Ontario. I go to Boston and I see industrial parks, technology innovation parks, where I go around a corner and there's a lovely treed area, a beautiful suburban area in outer Boston, where there are eight buildings. Each of them has two or three highly innovative, in the case of Boston, typically life sciences companies, but quite a lot. You go into their boardrooms and you see 10 or 15 patents along a wall, and over on this side of the boardroom you see the various plaques of the venture capital companies that are funding that particular enterprise. The system is successful. It breeds success. It's very difficult for Canada to compete against that, but we must try. We must do better. It's that sucking sound to the U.S. I think it's very hard to compete with that level of innovation.

Demonstrating our technology in Canada is really important and certainly pilot and prototype.... My companies in the past deployed a strategy where we would work with our government support, perhaps with Natural Resources Canada, helping us de-risk things. We tried to develop the intellectual property in Canada. Then we'd collaborate with the U.S. Department of Energy, where they have deeper pockets, to do demonstrations in the United States. We'd avoid like the plague trying to create new intellectual property on those contracts, because if you're a foreign entity demonstrating something in the U.S., then the U.S. has a right to license to a U.S. firm. There are strategies like that where we can work with Canada and still benefit from the U.S., but try to keep our knowledge and expertise in Canada.

● (1220)

Ms. Peggy Nash: Continuing along that line, and I'm happy to have other witnesses come in on that, what are some of the key factors that lead to that success?

For example, does the national origin of a company make a difference? In other words, do domestic companies tend to do more R and D and innovation and then development here in Canada, or is national origin of a company irrelevant? Are there things like patent pools—people have talked about an innovation box—for developing patents? Are these things important? How do you prevent the smaller companies from getting picked off?

It doesn't always happen. We have the Bombardiers of the world, which are global success stories. We have BlackBerry, which has been a phenomenal success. But we also have the Nortels, which came and went.

How do we create more of these success stories, and are they by necessity Canadian or can foreign companies have that same kind of success?

Mr. Andrew Stuart: I think we need foreign investment.

In the number of ventures I have developed, there has always been some Canadian support and leverage with some of our government programs to advance a prototype. As we got close to something that visibly looked like a product and could be brought to market, it was U.S., Austrian, or Hong Kong funding that came in and gave us that lift up.

As far as I am concerned, we're missing that element in our capital. It's foreign nations and foreign investors. I get excited when I have foreign strategic partners on the phone with me because I know they're serious. Yet at the same time, I need to protect my Canadian base and my resources.

I think with filling in that gap we need bigger risk takers. We can't be a nation of greatness without taking risk.

Ms. Peggy Nash: Thank you.

The Chair: Thank you, Mr. Stuart and Madam Nash.

Mr. Daniel, please.

Mr. Joe Daniel (Don Valley East, CPC): Thank you, folks, for being here.

I'm going to take a slightly different tack. Obviously disruptive technologies is a wonderful area in which we can grow our economy and grow our processes and technologies, etc. It's also at the leading edge. When you have some of these technologies, your companies have explosive growth.

One of the things that comes to mind is how you are dealing with getting the right people in your workforce, in your circumstances, and in terms of dealing with colleges, universities, etc., to get some of the basic skills. Are you developing those skills in-house, so you have the workforce you need for the future?

That question is for anybody.

Mr. Pierre-Luc Simard: I'll take that one.

As far as skills coming from university into our company is concerned, we try to work with our local university to give them feedback on the kind of expertise we need. Mostly for us it's around software. Software leads a big part of the world. Being good software engineers means not only.... It's what universities are good at, in learning how to learn new technology.

From within our company, we encourage pairing and working in teams to build up that knowledge and create and move development up in terms of knowledge. We look toward universities to give them that first base of curiosity and being able to learn new technology very quickly. Especially in our space, there is something new every day and every month.

Ms. Marie D'Iorio: I'd like to use the Nortel example.

Nortel, as time went on, had different mechanisms to support training of highly qualified personnel. They had institutes in different universities, and they came to know certain departments. They came to know the graduate students. They hired a lot of summer students. For them, it was the experience of working in that company, and it didn't much matter what the project was. You had the experience of how a company is run and where your project fit in the company's business. They kept looking at those students and would hire them.

It informed, as well, the type of training universities could provide to their undergraduates and graduate students. I think the whole ecosystem benefited from that experience. At the NRC, we had superb researchers and technicians who came from that training experience through Nortel.

● (1225)

Mr. Andrew Stuart: I would add to that. Programs such as what NSERC has to help hire summer students—not just summer students, I should say, but also students who are finished their third year and enter what is called a professional experience year—particularly for emerging small companies are fantastic. The kids come in with three years of education in their discipline. They join the company for 12 to 16 months before their fourth year starts. After a few months, they're just like regular employees. They love it. They're motivated. The NSERC program helps cover some of those costs. It's a much lower entry point than hiring a full-time position, yet we've gone back and hired some of those people full-time because they've been terrific students. The various programs that encourage and enable businesses to hire students is really one of the best ways to help develop the students, help develop the companies, and to create knowledge in Canada.

I've also, in my past, had 10 collaboration projects with various universities in Ontario, Quebec, and British Columbia. I found these to be very helpful in many ways, but I think the intellectual property rules are critical. In making effective collaborative work with universities, I think it must be clear that the private sector entity needs to raise capital, and it needs clear intellectual property statements or rights in their agreements. They can't rely on wishy-washy things, because when you try to take that the next step further, your investors are simply looking at something that's wishy-washy and it will not go anywhere.

Where we can develop these programs is very important. I'd add also, in speaking to people from IRAP last week, they said that Quebec is very well organized in the integration between industry and universities to get projects done; particularly, rapid response to an industry need is stronger than in other provinces. I'm not sure what they do there that's better, but I thought I'd mention it.

Mr. Joe Daniel: I'm reading between the lines in saying to you that people are not the problem. You can get enough people to grow your businesses with these disruptive technologies, with the right sorts of skills that you need.

Mr. Andrew Stuart: I don't think you can rely on students to achieve everything, so—

Mr. Joe Daniel: I've gone beyond that. This is now your business.

Mr. Andrew Stuart: I think one thing we do very well as a small business in a very high-knowledge field is act with consultants and knowledge-based experts, people who we could never afford to hire full-time, people who would never want to work for us full-time, but people who have very strong expertise and knowledge who can deliver that information in a just-in-time way. The Internet and tools to collaborate over the Internet are very helpful ways of staffing and satisfying that need.

Mr. Joe Daniel: When we look at these disruptive technologies, it's always looking back. They've already been successful. You have a successful company. Various nanomaterial products and services are now coming and are under way. Looking to the future, what do you think the next disruptive technologies are going to be in Canada?

Ms. Marie D'Iorio: When I think about nanotechnology, disruptive technologies come from the integration of technologies, so now it's not only about having something that's purely electrical engineering, but it's also biology, physics, chemistry, and engineering all coming together. That technology integration is key.

I think it's our ability, for example, to design new materials very quickly, and then to put those materials to use in a variety of applications. It links to your question about training. I think that training future entrepreneurs means they have to be comfortable with working at the edges of discipline, that yes, I'm an engineer, but I can work with a biologist on this sensor for personal medicine. I think that's very important in training.

Our disruptive technologies, in the future, will be at the edges of a number of fields. They're coming together, the software, the hardware, the sensing part, the biology or genomics part. That's where I see some of the disruptive technologies.

● (1230)

The Chair: Thank you, Ms. D'Iorio.

Now we will go to Mr. Masse for eight minutes.

Mr. Brian Masse (Windsor West, NDP): Thank you, witnesses, for being here today.

Some of the testimony we've heard, including yours, has really indicated that something that really matters, for me coming from an area where manufacturing has been hammered for the last decade, is that we have great ideas and we're able to get things to patent, but we can't get them into production for a lot of different reasons.

One of those reasons, which I'm concerned about, is that we don't have the decision-makers. We have a branch plant economy. I'd like your comments on that barrier. We have investors coming in from abroad owning Canadian companies or buying Canadian companies or having enough of a stake in them, but because of the economic advantage through programs in the United States or just because of the real numbers at the end of the day in terms of getting a product to market, the production of that Canadian idea is done elsewhere.

What can we do about that situation?

Mr. Andrew Stuart: I could comment on that. Since I was trying to reduce my opening remarks, I chose not to address that, but I'm very glad you raised the question.

I think Canadian control and ownership has been lost in so many of our leading firms like the Incos and the Alcans, and then you go a layer below that and you get the private equity guys taking out the middle players. Now instead of responding as an entrepreneur.... I recall years ago going to Dofasco and speaking with their vice-president of technology about an innovative technology I was working on. They're not there anymore. We have the branch plant manager from the great state of wherever and to connect with that Canadian entity is a whole different game. They have a different agenda. They have probably little or no mandate. Things have to go back to the head office in Atlanta or somewhere like that.

As part of this ecosystem, as entrepreneurs and people developing products and technology, we need to latch on to companies that are larger than we are to help get that market pull and to help get that Canadian prototype demonstrated before we take on the world. The ecosystem is not what it once was. I think this is an issue for us. I recall speaking to an investment banker a handful of years ago about another product and really trying to find out where there were great chemical companies in Canada. He mentioned two and I had already been working with them. At the end of the day, just about all of them had been taken out by private equity interests or were foreign owned.

Generally the R and D is definitely not done in Canada. They're not looking for ways to do things in Canada. Maybe a policy could encourage branch plant companies to work with Canadian companies for the benefit of Canada. That might be helpful. Maybe Industry Canada could encourage Canadian firms—and I don't like this—to find those non-Canadian entities to build their business with. That's kind of the reality we have. I think we're a bit weaker in the innovation ecosystem when we don't have Canadian-focused strategic partners on the business side to build up to.

● (1235)

Mr. Brian Masse: This is the thing that disturbs me. I come from an automotive town, and when we consider purchasing a vehicle, we talk about buying North American. That means with the supply line in North America predominantly being Canada and the United States. There's no problem with that as opposed to buying from offshore where there is obviously a lot less production connected to us. There was one particular case. We've talked a lot about getting credit or getting access to resources that can be taxpayer funded or backed. The concern is that if we subsidize that and then the product manufactured is something else, then this becomes an issue.

I want to point to one specific example that I'd like to get some commentary about. I meet with BDC and EDC in particular. Just this past month EDC decided to give Volkswagen $500 million in low-interest loans, which are going to Arkansas, I believe, and Mexico for production facilities there. We hear a lot about small and medium-sized businesses not having resources or not getting access to credit to get their businesses off the ground and to actually include production. They can't get that or if they get it, it's at high interest rates from the banks.

Mr. Andrew Stuart: I think you have to separate out EDC's activities a bit. They are there to support Canadian interests in export markets. I think what we're looking at is what we can do in Canadian markets. Sometimes it's harder for a Canadian company to win in Canada than it is for a Canadian company to win on an export contract because of EDC. It's been a great success for Canada. It's probably one of Canada's great success stories.

We need better in-Canada funding for Canadian parts and products. COFACE, if I'm saying that right, is the domestic equivalent of EDC in some regards, and it'd be good to have that. I'd also expand it and stronger.

We also note that, in our funding arrangements with organizations like IRAP, should we move to the United States or elsewhere in the world, we would have an obligation to pay back the IRAP money. I think that's an important innovation that's come in fairly recently, which recognizes that the Government of Canada is helping us, but also recognizes that we have to survive in the world markets and don't know what's going to happen. At least Canada is going to get some funds back.

I think you raise an important issue. I really can't stand seeing the deindustrialization of Canada, and I think this is a horrible situation we must change.

Mr. Brian Masse: I see it also through the lens of national security for our country, in the sense that the exiting of the manufacturing industry is more than just the jobs themselves, and the employment and so on. It's greater than that.

For nanotechnology, in terms of medical device applications, are we close to becoming a world leader in Canada? I've heard from different experts that we could be. That's what I've been told by different people. If that is the case, what can be done to get us there?

Ms. Marie D'Iorio: Well, I think we have very interesting small companies in the field of biomedical devices. Again, it's about the ecosystem. Some of those small companies come out of universities, and the question is how to help them transition from a spin-off from a university into an established company.

Certainly, I think that while we've seen incubation-type approaches in Toronto and across the country that are helpful, it's a question of having a strategy to take that company out of spin-off mode into establishing and growing it. You can't always be in the small company mode. You want to establish a base for it.

Again here, the important aspects of medical technology are working with the regulators, being patient with the investment to go to clinical trials, and not losing your energy in the process. It's a very long process. Those entrepreneurs need support throughout those stages, especially for medical devices. There's a societal aspect to it. There's a social licence. Is that what we want? Do we want that type of technology?

It may save us some money for preventative medicine and that's fine. But we must ask and answer the question, and that means working throughout the ecosystem, with the social sciences, the doctors, the hospitals, and the caregivers, as well as with the technologists who come up with the ideas.

● (1240)

The Chair: We're way over time, but I wanted you to be able to finish that answer.

Madam Gallant now, for the last question.

Mrs. Cheryl Gallant (Renfrew—Nipissing—Pembroke, CPC): Thank you, Mr. Chairman, and through you, to our witnesses.

I'd like to start off with Mr. Stuart. The nature of disruptive technologies is that another type of technology or manufacturing becomes obsolete. With your specialties, with the different areas that Isowater Corporation works in, and we'll start with the semiconductors....

I understand from what you said with the deuterium, they have stronger bonds. Would you explain to us, with the types of semiconductors that you would be changing, what would be a consequence of using deuterium, and how would that change the industry?

Mr. Andrew Stuart: Semiconductor silicon chips have always been hydrogenated to form silicon hydrogen bonds. What happens with deuterium is that instead of using light or normal hydrogen, if you use heavy hydrogen or deuterium, which weighs at a higher atomic mass, there's a unique chemistry that occurs between silicon and deuterium. There's a bond relaxation energy that occurs and a microchip that's been annealed in a deuterium atmosphere can actually take far higher temperatures, operate in more rugged conditions, and not break down, a longer life microchip. It will help enhance Moore's law of whatever it is: every year and one-half you double whatever the number of circuits on a semiconductor. Should that continue on to six or seven nanometre-size microchips, deuterium is a fundamental there.

Isowater's role, again, is to provide that to these companies to capture their spent or downgraded deuterium from the annealing oven and recycle that back at an enriched level to them. We would be focused on enabling that application, because right now a lot of the semiconductor users of this are concerned about where the supply of deuterium oxide or heavy water is going to be. It's just a major unknown to develop a semiconductor plant not knowing if your raw materials will be available.

Mrs. Cheryl Gallant: In terms of optical fibres, as I understand it, applying the deuterium mist to it would be like galvanizing steel.

How would protecting these fibre optics going through that process change the way we do things or enhance the lifespan? What is that going to do?

Mr. Andrew Stuart: Deuterium and particularly the hydroxyl ion with deuterium in it replaces the regular hydroxyl ion in the production of fibre optic cables or fibre optic lines. That allows much more light to pass through. The conventional way of doing it blocks about 30% of the light. If instead you use a deuterium technology, then you get much higher capacity in that fibre optic cable.

Again, this is developing customers in China, the United States, and Finland. They need a secure supply of deuterium oxide to expand and exploit that market, which slows down the pace of that innovation.

● (1245)

Mrs. Cheryl Gallant: Twice now you've mentioned the supply of deuterium. Is there a problem of supply?

Mr. Andrew Stuart: The key thing is that the nuclear demand for deuterium oxide, or heavy water, is growing substantially in countries like India. They're starting up four CANDU-equivalent reactors in 2015 and 2016. They have 10 to 12 more that are being started up in the next eight years. This is really going to put a shock on the world supply of deuterium oxide.

It's a market where we have a few inventories here in Canada and very little production elsewhere in the world. We believe that what's there will get sucked up by these nuclear uses and these non-nuclear applications will not have supply, and that will hinder their growth plans.

In our dialogue with these pharmaceutical companies, for example, deuterated pharmaceuticals take longer to metabolize in the body. You can have a lower dose with fewer side effects that lasts a longer time in your body. These companies are saying, “Andrew, I don't need a lot today, but in five years I will need a great deal. How are we going to get that?” That's sort of the same timeline as a complete crash in world supply.

That's where our collaboration with Canadian Nuclear Laboratories and our strategy to develop private sector production—never done before anywhere on earth—is scalable to meet these diverse, new non-nuclear uses of deuterium oxide. It is really quite exciting and why we cherish that relationship, and hope to do a lot in the Ottawa Valley.

Mrs. Cheryl Gallant: So you're working on that supply. That's what your company is doing, developing new ways.

Mr. Andrew Stuart: Yes.

Mrs. Cheryl Gallant: You mentioned pharmaceuticals and non-radioactive tracers. We go back to the idea of how it's going to change the industry. You mentioned lower dosages, longer lasting. Drug companies don't like that. They want you to buy more.

How are you going to break through that?

Mr. Andrew Stuart: Teva just invested $3.2 billion in a California drug company that only does deuterated drugs. It purchases for $3.2 billion a company with almost no revenues. These are the sorts of life science industries in the United States and why they're so powerful, yet this investment is based on the availability of material, and we don't see how they're going to get raw materials.

Big industries and pharmaceuticals are making very large investments to globally manufacture and distribute deuterated drugs. Again, our technology, which is independent of government energy policy and government financing, is a completely new idea and is needed for this commercial success.

Mrs. Cheryl Gallant: Are you saying that Canada is the world's leader in deuterium production?

Mr. Andrew Stuart: Canada was. I think India, by far, now is. India has a fantastic program, but I think India can't produce as much as it needs in the next 10 years. Canada does not produce. The United States does not produce. There is about one drum of deuterium oxide in the United States, in the government inventory, that is not radioactive. They have a bunch that are. In terms of the markets we need, you don't want to have a nuclear radioactive cellphone or whatever. You can't have the radioactivity in it. So there is a supply issue here.

Mrs. Cheryl Gallant: Without being a burden on Canadian taxpayers, what is it that we can do in terms of policy or making it easier for your R and D? What can we do in order to help you increase that production so that you have the capacity for all these different sectors of deuterium that you hope to see go forth and become more disruptive technology?

Mr. Andrew Stuart: I'd say that Canadian Nuclear Laboratories is a pillar of disruptive technology for Canada. We're slowly peeling away the layers of the onion on what those 3,000 scientists and engineers can do in this transition to the GOCO private operator, which is generally going to be a consortium of three or four Canadian and international companies. We must make sure and Industry Canada must make sure that the types of entrepreneurial developments that Isowater is working on still can thrive.

I've been told that the job of the GOCO is to do more faster. That really needs to be checked and tested. For the programs that Industry Canada and EDC have, all of the programs that are aligned in this ecosystem, and the new ones we need for disruptive technologies, Canadian Nuclear Laboratories must be a key partner in this to the benefit of Canadian enterprises.

● (1250)

The Chair: That will have to be the final word.

Thank you very much, Mr. Stuart, Madam D'Iorio, and Mr. Simard. We appreciate your testimony very much.

Colleagues, we'll adjourn now.