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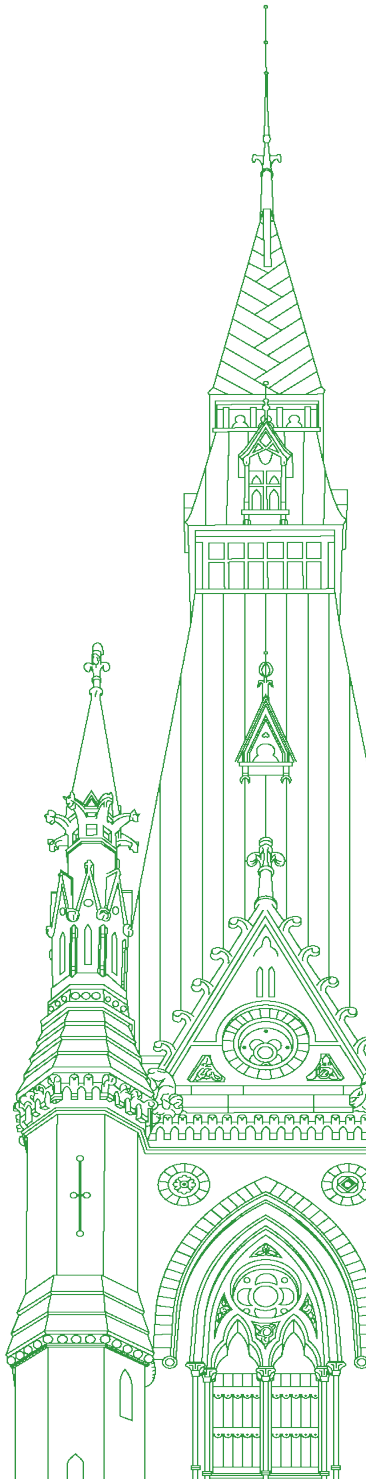

Chair: The Honourable Kirsty Duncan

Standing Committee on Science and Research

Tuesday, January 31, 2023

● (1100)

[*English*]

The Vice-Chair (Mr. Corey Tochor (Saskatoon—University, CPC)): I call this meeting to order.

Welcome to meeting number 26 of the House of Commons Standing Committee on Science and Research.

Today's meeting is taking place in a hybrid format, pursuant to the House order of June 23, 2022. Members are attending in person in the room and remotely by using the Zoom application.

Pursuant to Standing Order 108 and the motion adopted by the committee on Monday, September 26, 2022, we are continuing the study of the international moon shot programs.

I would like to make a few comments for the benefit of the witnesses and members. Please wait until I recognize you by name before speaking. For those taking part by video conference, click on the microphone icon to activate your mike, and please mute yourself when you are not speaking. With regard to interpretation for those on Zoom, you have the choice at the bottom of your screen to select either floor, English, or French. For those in the room, you can use the earpiece and select the desired channel.

Kindly remember that all comments should be addressed through the chair. For the members in the room, if you wish to speak, please raise your hand. For members on Zoom, please use the "raise hand" function. The clerk and I will manage the speaking order as best we can, and we appreciate your patience and understanding in this regard.

In accordance with our routine motion, I am informing the committee that all witnesses have completed their required connection tests in advance of the meeting. The clerk will inform the chair if any witnesses have not completed the test.

I'd like to now welcome our two witnesses for today. From the Canadian Brain Research Strategy, we have Dr. Young. Online, we have Dr. Blais, from the Université de Sherbrooke. Welcome to both individuals.

You will each will have five minutes for your opening remarks.

We will start with Dr. Young.

Dr. Jennie Young (Executive Director, Canadian Brain Research Strategy): Thank you, Mr. Chair and committee, for your work and attention to the cause of science.

I was born in Labrador City and I grew up in Fort McMurray, Alberta. I would never have dreamed of this opportunity to speak in front of all of you today.

I am Jennie Zin-Ney Young. I am the executive director of the Canadian Brain Research Strategy. I have a Ph.D. in neuroscience from the University of Alberta. I worked at MIT in the U.S. for 14 years as the scientific chief of staff for Nobel laureate Susumu Tonegawa and also for current Picower Institute director Li-Huei Tsai. I came back to Canada to tackle the challenge of understanding the brain in a different way, and I hope you'll see why from what you'll hear today.

Our brains are at the centre of everything that we do and are. They store our memories, create our passions, produce our art and commerce, and shape and build our societies. Brain injuries and impairments can impact everything that makes us, from what we perceive to what we feel to how we think, plan and interact with each other and the world.

The sad reality is that virtually every Canadian family has someone impacted by a neurological disorder, brain injury, mental illness or addiction. You yourself likely know someone. Increasingly, we are seeing people like Lou, from Ottawa. He was one of many people we spoke to in building our national strategy. Lou has Parkinson's disease. One of his children has autism, and he is taking care of a parent with early dementia.

As our population ages, the burden of brain disorders will only increase. Unfortunately for the vast majority most brain disorders, including mental illness, there are limited treatment options or none at all. For many, there are no cures.

Every Canadian deserves to have a healthy brain to help them realize their full potential throughout their lives. We need a national research strategy for the brain, because here's the challenge: Every human brain is composed of 100 billion cells—as many as there are stars in our galaxy—making 1,000 trillion neuronal connections with each other. Each connection shapes our unique experience and genetics, and each one is constantly changing. Understanding the most complex biological system ever known might seem like an impossible task, but we have to rise to the challenge, because the better we know how a system works, the more likely we are able to fix it when it breaks. The only hope and path to treatments and cures is to gain new knowledge through research.

We are on the threshold of making remarkable advances in understanding the brain, ones that could lead to treatments and cures in our lifetimes for our families. Canadian neuroscientists and mental health researchers—and we rank in the top five in the world—are poised to to make a major leap, a moon shot, in brain science. New technologies like artificial intelligence have the potential to radically change what is even possible in brain research, and new data on the brain is accumulating faster than at any time in history.

Imagine the implications of a breakthrough in a disease like Alzheimer's. Imagine the cost savings and reduced burden on our health care system when we are able to improve on the health outcomes of millions of Canadians with better treatments and by having healthier brains.

Brain disorders cost the Canadian economy $61 billion per year, and this number is growing. For a tiny percentage of that amount, we can implement a national strategy now to leverage the unique strengths we have in our brain research ecosystem and, more importantly, to improve the lifelong well-being of our citizens, families and communities.

The human mind is our most valuable resource in the world. The U.S. has invested in their national BRAIN initiative, and the EU, Korea, Japan and China have taken similar measures. From South America to Africa to Oceania, many other nations have brain research initiatives under development, but we have an incredible and unique opportunity before us for Canada to lead a global paradigm shift in brain research.

The Canadian brain research strategy is a pan-Canadian, community-led effort that unites a broad, diverse coalition across the brain research ecosystem. This committee has heard from some of our scientific leaders, and there are 13 briefs from some of the nonprofits and health charities in our coalition. This strategy also comes from indigenous stakeholders, patients and their families. More than 25 organizations funding brain research are also at the table, and we are bringing in industry partners.

We have the network and partnerships and a unified, consolidated vision, and we have a responsibility to make a difference in brain health and disease for all Canadians and for the world.

● (1105)

Thank you.

The Vice-Chair (Mr. Corey Tochor): Thank you, Dr. Young.

We will now hear from Dr. Blais.

[*Translation*]

Dr. Alexandre Blais (Scientific Director and Professor, Institut quantique, Université de Sherbrooke): Good morning, and thank you for giving me the opportunity to speak to you today.

[*English*]

In my opinion, moon shot programs can help Canada play a leading role on the global stage in areas of strategic importance. Over the next few minutes, I will outline some elements that I believe may help make moon shots successful, as well as some aspects to be wary of. These comments build on my experience participating in large-scale U.S., European and Canadian quantum research efforts.

First, curiosity-driven research is at the root of innovation. Had the founders of quantum physics focused on innovation rather than understanding the inner workings of nature at the atomic level, they would probably have devoted their efforts to improving the telegraph or candle wax. Had this been the case, technologies that have transformed society and whose development relied on quantum physics—such as computers, lasers and GPS—would not have been possible. In short, technological revolutions are founded on curiosity-driven research, and any moon shot program should reflect that.

Second, by definition, moon shots have ambitious, big-horizon objectives. The level and, importantly, duration of funding should reflect that.

An example of an existing program that does this well is the Canada first research excellence fund, or CFREF, which offers support over seven years. CFREF funding at the Université de Sherbrooke has been transformative. The seven-year duration of the support allowed us to put forward a long-term vision for the development of quantum science and technology, and to act on that vision.

Another characteristic I recommend moon shot programs to replicate is the flexibility of the funding. Indeed, with most funding opportunities, there is little room for new ideas on how to best use the funds once the grant starts. Large-scale and long-term initiatives should be given the latitude to make the most out of the allocated funds.

In the case of Sherbrooke's CFREF, this flexibility and the long-term nature of the program allowed us to take actions that led to the creation of the quantum science innovation zone in the Sherbrooke area to support Sherbrooke-based start-ups and attract companies from abroad. In short, it allowed the Institut quantique to have an impact well beyond producing excellent science. This was made possible thanks to the long duration of the funding and its flexibility.

Another lesson from this example is that supporting centres of excellence can lead to outsized impact. These centres help create the capacity to attract talent and rally the efforts of the broader research community so that we can deliver on ambitious projects.

Moon shots also mean making choices. To have an impact, moon shots should be based on Canadian issues and build on our strengths. Examples that come to mind are aging, biodiversity, climate change and quantum.

For quantum specifically, there are examples of moon shot programs in other countries from which we may get inspiration. In all cases that I am aware of, those programs were not prescriptive about the specific scientific and technological goals, which were instead left to be defined by the broad community of academic, industry and government players.

More generally, moon shots can help inspire the next generation of scientists and innovators. By supporting ambitious research projects, Canada can show young people how science and innovation are exciting and rewarding fields to work in and encourage them to pursue careers in these areas.

Let me now briefly mention a few aspects to be wary of.

First, funding opportunities typically focus on operations or infrastructure. Examples are CFREF, which funds operations, and CFI, which funds infrastructure. However, large-scale efforts need both. This should be baked into the program or, at the minimum, there should be coordination among funding agencies.

Moreover, international collaboration will certainly be important to any moon shot. It can be difficult for research money to flow across borders, but ways to incentivize key international players to actively contribute to these efforts should be built into these programs.

Attracting talent to Canada, including established researchers and students, is another important piece. However, despite the labour shortage, it seems to be getting more difficult rather than easier to do so.

Finally, training is a crucial piece. For example, it is a fact that we are not training enough students and post-docs in quantum science and technology. A quantum moon shot—and it's probably true of any moon shot—should support academic institutions in training more students and developing innovative programs to help create pipelines of capable talent that can meet the needs of moon shots, as well as the start-up ecosystem that will grow around these moon shots.

In summary, a moon shot program would help Canada remain at the forefront of science and technology. Moon shots should be based on Canadian issues and build on our strengths.

● (1110)

Flexibility and long-term support are crucial. Support to centres of excellence will help make these moon shots a success.

Thank you.

The Vice-Chair (Mr. Corey Tochor): Thank you to Dr. Blais and Dr. Young for that testimony.

We will now start with the six-minute round of questioning. We will have MP Soroka kick us off.

Mr. Gerald Soroka (Yellowhead, CPC): Thank you, Mr. Chair.

I'll start off with Ms. Young. You started first and you're a fellow Albertan. It's good to see you.

You guys are studying the brain itself and trying to understand its connections. When you have a billion different cells in there, it's pretty difficult. Where have you found any great revelations or unbelievable things so far?

Dr. Jennie Young: Thank you, Mr. Chair. That's a very good question.

I've studied Alzheimer's disease for a long time. What's amazing is that we are finally starting to make progress in that. For a very long time, people thought it would be too late by the time we could discover it, but having these new technologies to let us detect the disease earlier and having a better understanding of the range of impacts are a reflection of how quickly the field has moved. For decades, there was nothing.

It's these new technologies like AI, and having more data than we've ever had before, that are going to let us build on these initial findings and really make a leap forward.

● (1115)

Mr. Gerald Soroka: You mentioned Alzheimer's. I have had family members and still have family members affected by this disease.

Where do you see that going? Is this like a drug enhancement or more of a brain stimulation...? What is there to reverse that, or to at least stop that process from continuing?

Dr. Jennie Young: That's a really great question.

There are a number of different therapies. As we get more data on the brain, we're seeing that it's not just one disease; it shows up differently in different people. Having a brain stimulation approach might work for some people, or having a drug might work with other people.

I think that's why we had so many failures before. We treated it as one disease and we treated it the same way in all people. To make an impact, we really need to have different avenues of approach and to understand the complexity of the brain across different people and different populations. There are a lot of new technologies and new approaches coming up.

Mr. Gerald Soroka: I'll ask a really easy question, then. Could you project as to when we might have a cure for Alzheimer's?

Dr. Jennie Young: That is a very tricky question, but I appreciate that.

I'm aware that some colleagues in our coalition are working on this answer. The Centre for Aging and Brain Health Innovation, CABHI, is proposing dementia zero by 2050. I think it is something we can aim for.

I think the aspects of a brain moon shot that Dr. Blais brought up about stability and long-term funding will enable something like this to happen. By 2050, we could possibly have not just real treatments that make a big impact and improve quality of life but could possibly aim for something like dementia zero.

Mr. Gerald Soroka: Dr. Young, thank you for that. I just wish you'd have it a little quicker. At my age, I might need the help a little more quickly.

Dr. Blais, you mentioned that the appropriate funding as well as the flexibility of funding are necessary for the moon shot programs. Could you please describe a bit more what you meant by that?

Dr. Alexandre Blais: Yes. Thank you for the question.

Let me switch to French to answer the question. That will be easier for me.

[*Translation*]

When filing the grant application, you need to indicate how the funds will be spent in the years covered by the grant. You also need to indicate the number of students and postdoctoral students you will have and what equipment you will be using, among other things. The reality is, as I said earlier, it's hard to predict the pace of scientific progress and needs from year to year. For example, it's imperative that the programs allow us to acquire new equipment instead of hiring a certain number of students as planned. That's what's really going to change the game.

We're developing ecosystems as part of international moonshot programs. For example, in Sherbrooke, we're developing them through the Canada First Research Excellence Fund. To do it, we need the most talented scientific researchers and students, but we also need people to manage the research. However, very few major grants, if any, provide funding for these research staff, and without them productivity drops drastically.

So my answer is this: We need the flexibility to decide where to allocate budgets and to hire more staff, something research grants typically do not provide.

● (1120)

[*English*]

The Vice-Chair (Mr. Corey Tochor): Thank you, MP Soroka.

Now we're moving on to the Liberals for their six-minute round.

We have MP Lauzon.

Mr. Stéphane Lauzon (Argenteuil—La Petite-Nation, Lib.): Thanks, Mr. Chair.

[*Translation*]

I'd like to thank the two witnesses, Dr. Young and Dr. Blais, for being here.

Dr. Young, you submitted a brief in February 2022 as part of our Successes, Challenges and Opportunities for Science in Canada study.

Today, you talked about the mind, the human brain, and what that all could mean. You gave examples related to autism, Parkinson's disease, Asperger's syndrome and other mental illnesses. You also talked about a “dementia zero” goal by 2050, and aging-related illnesses.

Are there targets for each degenerative disease? Can you briefly explain what leads you to be able to predict what's to come in 25 years for dementia, when you can't do that for autism or Asperger's syndrome?

Dr. Jennie Young: Thank you for your question.

Please accept my apologies, but I'm still learning French.

[*English*]

Mr. Stéphane Lauzon: You can answer in English if you want.

Dr. Jennie Young: It is a really excellent question.

This is why a national research strategy for the brain will work. It's because all of these disorders are related to one another. Some of the briefs submitted by organizations in our coalition have presented some data on this.

Having a basic, fundamental understanding of how the system works will let us better fix it when something goes wrong. We have been finding this more recently in the last few decades. For example, Alzheimer's disease has a large component of inflammation or it causes the immune system to react, perhaps in a bad way. It turns out that other diseases that we know have involved immune components, such as multiple sclerosis, might draw on these same mechanisms at the base. Having an understanding of the brain and how it develops through all of the different ages is going to contribute knowledge that will bring therapies and cures to other diseases as well.

[*Translation*]

Mr. Stéphane Lauzon: In that same document, you outlined six initiatives to transform brain research, including enhanced sharing of data on the science platform you mentioned in your opening remarks.

For the benefit of committee members, I'd like you to tell us about the initiatives that make this a moonshot program.

[*English*]

Dr. Jennie Young: To summarize the six areas, what we're really talking about is investing in people and, as Dr. Blais mentioned, having stability and flexibility in funding. It's not about just targeting a specific scientific question but about raising up the entire ecosystem. It's investing in our brain science workforce across all sectors in academia, in industry and in other areas. It's being able to scale up brain research from our smallest research centres to the largest hubs.

The six areas are specific ways that we can promote collaborative transdisciplinary and open brain research. It is our unique strength in Canada that we can do this. I worked at major research centres in the U.S.; this is something only Canada has. This is the only way that we're going to make any impact in studying something as complex as the brain.

Some of the six initiatives are around open science, which is the sharing of data, and sharing of protocols and materials. It's that attitude of sharing that we have in Canada. As we all know, research can be very competitive for these dollars, but in Canada we have this culture of sharing. It's about having research platforms, and that's speaking to shared resources.

Dr. Guy Rouleau spoke to this committee. He said that they were able to attract a candidate who had applied for a job in Germany and was offered 10 million euros. The candidate went to McGill, because in Germany they need 10 million euros to set up their lab, but at McGill they have the resources and infrastructure there that are being shared. It's not their own; it's being shared, and it's going to be collaborative.

We want to do that for the entire ecosystem in Canada. We have 30 research leaders and directors of institutes across the country, from major centres like Toronto all the way to Lethbridge and to Carleton University here in Ottawa. We want to leverage that excellence.

That's what our priorities are about. It's being able to bring out the excellence across the country together. It's a unique and special thing we have in Canada.

● (1125)

The Vice-Chair (Mr. Corey Tochor): Thank you very much.

We will now move on to the Bloc and MP Blanchette.

[*Translation*]

Mr. Maxime Blanchette-Joncas (Rimouski-Neigette—Témiscouata—Les Basques, BQ): Thank you very much, Mr. Chair. Let me begin by saying hello. It's a pleasure to see you as chair of the committee.

Let me also devote a most sincere thought to our colleague Kirsty Duncan, who may be watching. I wish her a speedy recovery. We look forward to seeing her again.

Dr. Blais, I'm pleased and proud to speak to you in French today. The quantum field is currently experiencing a major boom, particularly so at the institute you head up in Sherbrooke. This is the result of coordinated action by the federal and Quebec governments, notably with Canada's National Quantum Strategy and the designation of an innovation zone. Significant resources have been allocated to research and marketing in the quantum field.

How have these positive initiatives really made a difference, especially for quantum research in Quebec?

Dr. Alexandre Blais: Thank you for the question.

As you said, the Institut quantique de Sherbrooke enjoys significant investments, both federal and provincial. Over the past 10 years, we've developed a vision for developing an ecosystem that allows our students to take great ideas from basic research and create their own businesses. This has led to the emergence of several startups in the quantum field in Sherbrooke.

With support from the Quebec government, this eventually led to the establishment of a quantum sciences Innovation Zone. You alluded to that earlier. We're talking about a major investment of over $200 million here, to support these startups and attract businesses from outside, many of which have already begun to set up shop in Sherbrooke.

In our city, as in most places in the country that are home to major centres in the quantum field, our number one export used to be talent. We used to train people who then went to work abroad for the big guys like Google, IBM and so on. But thanks to the efforts we made over the past few years, we're now able to keep that talent in Sherbrooke. We invest in training these individuals and we can benefit from their know-how during the productive years of their career.

As I said in my remarks, it was really the stable, long-term, flexible funding that allowed us to develop this vision and move nimbly toward this idea.

Mr. Maxime Blanchette-Joncas: Thank you, Dr. Blais. It's great to hear about talent attraction and retention as well. I'll come back to that a little later.

Would this model in the quantum field be worth replicating in other fields?

Dr. Alexandre Blais: Yes, absolutely. It takes places that are willing to be agile, though. I can say that one of the advantages at University of Sherbrooke is that we're a small institution, but we know how to be very agile and adapt quickly to changing situations.

That's what can sometimes make this model difficult to replicate, as I've seen from talking with some of my colleagues. However, it would no doubt be worth replicating.

● (1130)

Mr. Maxime Blanchette-Joncas: Thank you, Dr. Blais.

In your opinion, how could the federal government concretely help you develop quantum research?

Dr. Alexandre Blais: Thank you.

The National Quantum Strategy, which represents a $360 million investment over seven years, was announced just a few weeks ago. It's a great first step.

On the other hand, this initial strategy, if I can call it that, uses existing programs to distribute funds very evenly but also randomly in response to small grant applications from small groups across the country. This approach will yield some nice research, but it will be uncoordinated, and that will prevent it from being a moonshot program. So it's time to be a little more strategic.

That's why I really like the idea of moonshot programs. The most important thing is to support centres of excellence in quantum research, which are few and far between in this country. They can really help bring the community together. With their ecosystem and research excellence, they're able to produce the results needed to make moonshot programs happen. That takes resources, obviously.

In short, my message is that we need to put a little more strategy in the National Quantum Strategy.

Mr. Maxime Blanchette-Joncas: Thank you, Dr. Blais.

You spoke of resources. We'll come back to talent attraction and retention later.

Canada lagging behind in its R&D investments is nothing new. It's the only G7 country to have reduced its investments in research and development in the past 20 years. Only a few months ago, *Science* magazine—not just any magazine—denounced the situation and expressed concern about researchers coming to Canada for their research but getting no funding.

This sends the wrong message. If you look across the border, you see that the Americans have doubled their funding for research through the National Science Foundation. So you can see that the brains will inevitably drain to the United States. How do you keep the brains here if the federal government isn't investing?

Dr. Alexandre Blais: That's an excellent question.

[*English*]

The Vice-Chair (Mr. Corey Tochor): I'm sorry, Dr. Blais. I'm going to have to get you to give a written submission for the answer to that question, because we're out of time.

Dr. Alexandre Blais: Will do.

Thank you.

The Vice-Chair (Mr. Corey Tochor): Thank you very much, Mr. Blanchette-Joncas.

Now we'll go on to the NDP. MP Cannings, you have six minutes.

Mr. Richard Cannings (South Okanagan—West Kootenay, NDP): Thank you.

I'm going to allow Dr. Blais to continue on that line. I was going to go there anyway eventually, but I'll go there right now.

We've been hearing a lot in this committee and elsewhere in Parliament lately about the insufficient funding for training new talent—students and post-docs. The scholarships that are provided by the tri-councils have not gone up in 20 years.

It's all very well to have moon shots and great ideas and so on, but what I appreciate about your presentation is that you really set the background for what we need to do to make these moon shots successful.

On that specific item, what do you feel we have to do to make sure that students stay here in Canada to do their training? What would help to build your labs and help build the research programs? Is it important to make sure that the funding increases so that they can live dignified lives while working on these very important programs?

[*Translation*]

Dr. Alexandre Blais: Thank you for the question.

There's a lot to say here so I'll limit myself to a few ideas.

First of all, student grants haven't increased for several years, so right now, students are quite frankly living below the poverty line. So that really needs to change.

Getting more young people into science and technology should be everyone's mission, and it's hard to do that right now. Scholarships alone will not do the trick. We also need to start early, and for that we need a national program to get young people interested in science and technology. Without that, we won't make it.

I would add that this isn't the first time the quantum field has changed our lives or been on the verge of it. It did that with the laser and today's computers. Without the quantum field, we wouldn't be talking to each other today on Zoom.

If we look at the results of that first quantum revolution, which happened around the 1950s, we can see that Canada doesn't have the requisite industries, including semiconductors, or businesses like Apple, Facebook and company. In research, Canada was there from the beginning of that revolution, but later on those industries didn't take hold in this country. They moved to the United States instead, and now they're in Korea and Taiwan.

So we need to invest more in research, but in a strategic way. We have to be ambitious and make choices. You can't excel at everything. That's why I really like the idea of moonshot programs. You have to choose the specific programs in which you will excel. Also, the entire chain, from basic research to marketing, should be a priority.

● (1135)

[*English*]

Mr. Richard Cannings: Thank you, and I would like to continue on that.

You mentioned the Canada first research excellence fund and explained why it was a good model. It had long-term flexible funding. Do you see this as simply a model for moon shot programs, or is it something into which we could inject more funds, obviously? How do you see that fitting in with the idea of moon shot funds, whether its for aging, biodiversity or climate change, as you mentioned?

Is this fund something that we can build on, or should we create something like it for moon shots that is perhaps even more ambitious?

[*Translation*]

Dr. Alexandre Blais: It's a good model to be followed, I just don't feel it's exactly the program we need. The Canada First Research Excellence Fund supports one institution in its mission. A moonshot program, on the other hand, should encourage several Canadian institutions to work together. The CFREF doesn't forbid it, but that's not its central focus. Canada needs a program with a different vision that's a little more global.

[*English*]

Mr. Richard Cannings: You talked about sharing data and open science. Could you spend a minute expanding on that? We've talked before in this committee about how open science has not been the common practice in science. It's been a very competitive field, generally.

How does your strategy seek to change that, and how could we do that for other sectors in science?

Dr. Jennie Young: Thank you for that really great question.

There are a number of challenges that are brought up by open science. In Canada, we do have this culture of collaboration and sharing, despite the competition. However, there are often barriers for people who want to share their data. It's less about the culture issues, compared to a very competitive place, such as where I was at MIT; it's more about that infrastructure.

Dr. Blais also mentioned the need for staff to manage research that is being done. These are a lot of positions to enable the sharing of data, but there is no funding for those types of research positions, especially in the smaller centres. Those are the centres that would really benefit from being able to share their data and also to take part in research. Those are some of the challenges around open science.

I'm aware, and I think it's fantastic, that the government has a federal road map for open science and that the tri-agency is taking steps to try and make this happen for all grants that are funded by federal research. It makes sense. This is research done with public money, and it should be shared.

The Vice-Chair (Mr. Corey Tochor): Thank you, Dr. Young. I'm just trying to keep on schedule here.

Now we're going to move on to the five-minute rounds. We're going to MP Lobb.

● (1140)

Mr. Ben Lobb (Huron—Bruce, CPC): Thanks, Mr. Chair.

Our last member asked a question on the idea of open science and open sharing. This was discussed at the industry committee about seven years ago.

When the federal or provincial governments fund an initiative, who is it that should have the ownership of that finding or that breakthrough research? Is it the research that received all the funding? Is it the university that hosted it? Should the government have some say in it or an ownership in it? What do most of the agreements look like today?

Dr. Jennie Young: Thank you for that really excellent question.

You have brought up a number of challenges around ownership of intellectual property and things like that that come out from open science.

I'll address your point about industry first.

Open science does not preclude commercialization and industry being involved. In fact, in Canada, Biogen and Roche and a number of other companies have invested in open science projects. This is only in Canada. These are large multinationals, and it's because they know we will share this data and because the level of the data that they are sharing is not going to lead to commercialization immediately. This is just collecting the initial information. There are many steps before it gets to commercialization.

I just want to put it out there that commercialization and open science are not necessarily at odds and that having intellectual property is not necessarily at odds with sharing openly. It depends on the situation.

Mr. Ben Lobb: What do the agreements look like in that one example you provided me, Biogen?

Dr. Jennie Young: Biogen and Roche are funding a multiple sclerosis trial in Canada.

Mr. Ben Lobb: In that trial, is there wording to the effect that if there are findings, they own the rights to those findings? Who owns the rights to those findings?

Dr. Jennie Young: I don't know the details of this exact legal agreement. Basically what they have allowed is.... They are collecting a data set on a number of patients and following them over a long number of years. That data is open. They get first access to look at the data, and then it becomes open to everyone and everyone can use that data for what they are interested in.

In terms of the agreements, you're right in that this is an area where, if there was more federal oversight or maybe a national policy that would help different organizations that are funding and supporting research draw up these contracts better, it would really enable open science to happen more efficiently, because people do want to do this. For example, a lot of the different funding organizations I mentioned—we have more than 25 at the table—are already funding open science. They have to go and make their own legal contracts every time, and it's difficult and inefficient.

Mr. Ben Lobb: I think we all saw in real time during the pandemic that the taxpayer kind of pays two or three times. They pay their tax dollars and the dollars go into research to create a vaccine. When there is a vaccine created, they pay again. You don't get the insider price, really. You pay the full price, or the best price that your government can negotiate at a large scale. You'd hope in some cases that if there was a moon shot on some of these really breakthrough things like Alzheimer's, dementia, MS, ALS or what have you, the taxpayer would only....

It isn't too much to ask, I don't think. Anyhow, that's a larger discussion for a different day.

The other thing is just in regard to moon shots and different things like this on the commercialization front. Through the years on the industry committee and the health committee, I've heard different things. There are people who love to sit in their labs at universities. It isn't a knock against the individual, because they're obviously very brilliant, but they just like to be in the lab. They don't want to get involved with commercialization. It almost becomes a lifetime's worth of research, and that's fine, but if you do have something that could potentially be commercialized for the benefit of the human good.... Are there a huge number of cases like this out there, or is that an urban legend?

● (1145)

Dr. Jennie Young: I really—

The Vice-Chair (Mr. Corey Tochor): I'm sorry to do this, Dr. Young.

Ben, do you mind if we can get that answer in a written form?

Mr. Ben Lobb: Well, I'm tempted to challenge the chair on that ruling, but for this time I'll let it go.

Voices: Oh, oh!

The Vice-Chair (Mr. Corey Tochor): Challenge all you want, but the clock says you're over already.

Mr. Ben Lobb: Okay. That's good. Thank you.

The Vice-Chair (Mr. Corey Tochor): Thank you so much for the questions. More importantly, we're really grateful for the answers we heard today from Dr. Young.

Now we'll move on to MP Bradford.

Ms. Valerie Bradford (Kitchener South—Hespeler, Lib.): Thank you, Mr. Chair.

Thank you to both of our witnesses today. Obviously these are two areas that, in my opinion, are ideal for moon shots.

My first questions will be to Dr. Blais. Back in December, Minister Champagne made the announcement about the quantum strategy at the Institute for Quantum Computing, which is located in Waterloo. Can you tell us how that quantum strategy is going to contribute to the advancement of science and innovation?

M. Alexandre Blais: Yes.

[*Translation*]

Thank you for the question.

One key aspect of the strategy is to use existing programs, particularly those of the Natural Sciences and Engineering Research Council of Canada, and Alliance Missions grants, which foster collaboration between university laboratories and industry. So, about half of the resources come from the council and are aimed at bringing products to market. A lot of money also goes to industry internships like Mitacs.

However, like I said in one of my previous answers, I feel there's room for more strategy in Canada's National Quantum Strategy, including supporting and fostering collaboration between centres of excellence, such as moonshot programs. This could help take us even further than this first draft of the strategy allows.

[*English*]

Ms. Valerie Bradford: My next question is this: How can cooperation among quantum researchers, industry and government be facilitated?

[*Translation*]

Dr. Alexandre Blais: Thank you for the question.

Dr. Young talked a bit about this in one of her responses. Several issues come into play here, some of them related to intellectual property.

Intellectual property agreements need to be clear. They are usually negotiated one university at a time, and as far as I know, we have no national guidance on this. So that can make it a bit more complex, because if you have multiple university partners, each will have their own ways of doing things with respect to intellectual property.

Having said that, I think the Alliance grant program is a good start, because it helps businesses work together with industry.

On the other hand, in the quantum field, we must never forget that we have to do much more than work with industry. Fundamental discoveries have yet to be made. If we only support research done by university laboratories and industry, we risk missing out on a lot of basic research that's needed to develop technologies. It's important to monitor that, but we shouldn't just invest in the research aspect.

[*English*]

Ms. Valerie Bradford: I'll go very quickly to Dr. Young.

In your opening statement, you really made a compelling case for further research in brain strategy. I was just wondering if you can tell me if you're working on anything with respect to brain injury. We know that it can be from either repeated concussions or a traumatic event, such as an accident. What's your experience with that, and what research is being done in that area?

Dr. Jennie Young: I am not as familiar with that area. However, in the lab I worked in at MIT, we focused on Alzheimer's disease, but we also had somebody in the lab studying brain injury. We could see that there were some similarities in how the brain was reacting in the immune response, for example. This is again going back to the point that fundamental knowledge about the brain is going to benefit all of these different areas, whether you're talking about a brain injury or about Alzheimer's disease.

In fact, the Canadian Concussion Network, which is a network of researchers and patients, and Brain Injury Canada, which is a nonprofit foundation, are all part of this coalition as well.

● (1150)

Ms. Valerie Bradford: How are areas of research prioritized, then?

Dr. Jennie Young: That is a really good question.

At a national strategy level, we're really focused on what will help the entire ecosystem, but we have different national strategies to ask the specific science questions. We have a national dementia strategy. We have a national autism strategy being developed. That is where you get the experts in the field asking the specific science questions, but we want to enable the scientists to be able to tackle these questions.

Ms. Valerie Bradford: Thank you.

The Vice-Chair (Mr. Corey Tochor): Thank you so much for the questions and answers. I'm sorry, but we're out of time.

We will go on to the next round of questions, which are for two and a half minutes.

We're going to start with MP Blanchette-Joncas.

[*Translation*]

Mr. Maxime Blanchette-Joncas: Thank you, Mr. Chair.

Dr. Blais, I'm going to address you again and go back to the questions I asked earlier.

In your last comments, you mentioned the National Quantum Strategy. From what I understand, or deduce from your message, investing in the strategy is a good thing, but it lacks vision and coordination by the federal government. The strategy has no clear direction.

Am I right?

Dr. Alexandre Blais: I completely agree with that statement.

Mr. Maxime Blanchette-Joncas: Thank you.

I will now come back to attracting and retaining talent. I set the scene for this earlier when I mentioned Canada's lack of investment. Normally, when we look elsewhere, things don't look so bad here. In this case, however, things do look pretty bad here. Canada is at the bottom of the list in the G7 when it comes to investment in research and development.

You said we were building on an attraction-based model, but now we're making sure we also make an effort to retain talent. Canada is the only G7 country to have lost researchers in the past six years. I point to the efforts of the University of Sherbrooke and some other universities, but when it comes to graduate school completion, once again Canada is at the bottom of the G7.

It's all well and good to come up with a national quantum and other strategies or moonshot programs, but if we don't have the investments needed, how can we ensure we've got the best talent in our establishments and research centres like yours?

Dr. Alexandre Blais: Thank you for the question, but it's obviously not an easy one to answer.

I believe we need to keep attracting certain specific individuals by investing heavily in research chair programs. That said, some of these programs, like Canada Excellence Research Chairs, look really good on paper, but if you compare their resources with those in the outside world, they don't necessarily have enough to attract the A-list stars, if you will pardon the expression.

I think we need to continue exploring the research chair issue.

Mr. Maxime Blanchette-Joncas: In your capacity as professor and scientific director of the Institut quantique at the University of Sherbrooke, I'd like you to tell me what concrete impact the federal government's underfunding will have on the institute.

Dr. Alexandre Blais: We're certainly having trouble attracting the top talent. Canada had a head start in the quantum field, we were in it from the beginning. However, other countries are getting ahead of the curve.

The danger is that the same thing we saw in the first quantum revolution will happen again: we'll be there at the start, but we won't be able to bring things to market once we get to that stage.

[*English*]

The Vice-Chair (Mr. Corey Tochor): Again, thank you so much for the round of questions and answers.

We'll move to the NDP and Mr. Cannings.

Mr. Richard Cannings: Thank you.

I'm going to follow up on what Dr. Blais was talking about and direct my question to Dr. Young about the Canadian Brain Research Strategy. I guess what I'm concerned with, or interested in, is what other countries are doing. Are you modelling this strategy on strategies from other countries, maybe on brain research in other sectors?

Canada is a world leader in brain research, as we've heard many times. Are we in danger of losing that lead? I guess I'm comparing what we're doing with what other countries are doing. What do we need to do in the future?

Dr. Jennie Young: To compare to other countries, the U.S., of course, is a natural comparison. They had their BRAIN initiative from 2014 to 2024, and it's been extended. As of last January—just over a year ago—they had invested $2.4 billion in their BRAIN initiative, and it will be more than $5 billion when they are finished at the end of their 10 years.

The distinction is that it's gone to 1,100 grants and “hundreds of researchers”. We cannot compete with that scale of funding in Canada, but we have other strengths we can leverage to make our smarter strategic investments. That is one of the comparisons.

The EU has also had a brain initiative for 10 years. It started in 2013. They are now in their last phase of investing in infrastructure, and that was to the tune of almost a billion euros. Japan also has one, and that started in 2014. China and Korea also have their own brain initiatives, and these all started around the same time.

There are also emerging brain initiatives in Australia and New Zealand and Finland. Even non-OECD countries in Latin America and the Caribbean are forming their own brain initiatives, and there is a brain research initiative in Africa as well.

● (1155)

Mr. Richard Cannings: What can we learn from all those other initiatives? Are there parts of them that are applicable to Canada?

Dr. Jennie Young: The EU's was targeted initially on specific science questions but is now expanding to build the infrastructure for research. It's a valuable lesson.

I think we have a lot to contribute. We presented to the International Brain Initiative, where all these countries were present. Everybody was interested to hear our model, because theirs are all just about the scientist, while we see the strength in bringing all of these other stakeholders on board.

Mr. Richard Cannings: Thank you.

The Vice-Chair (Mr. Corey Tochor): Thank you to our members and witnesses.

Thank you, Dr. Blais and Dr. Young, for your submissions today and answering questions for the members. We very much appreciate that.

We will briefly suspend before going to Zoom for our in camera portion of the meeting, so I will ask all witnesses and guests to please leave the meeting. I wish you all a good rest of your day.

We stand suspended.

[*Proceedings continue in camera*]