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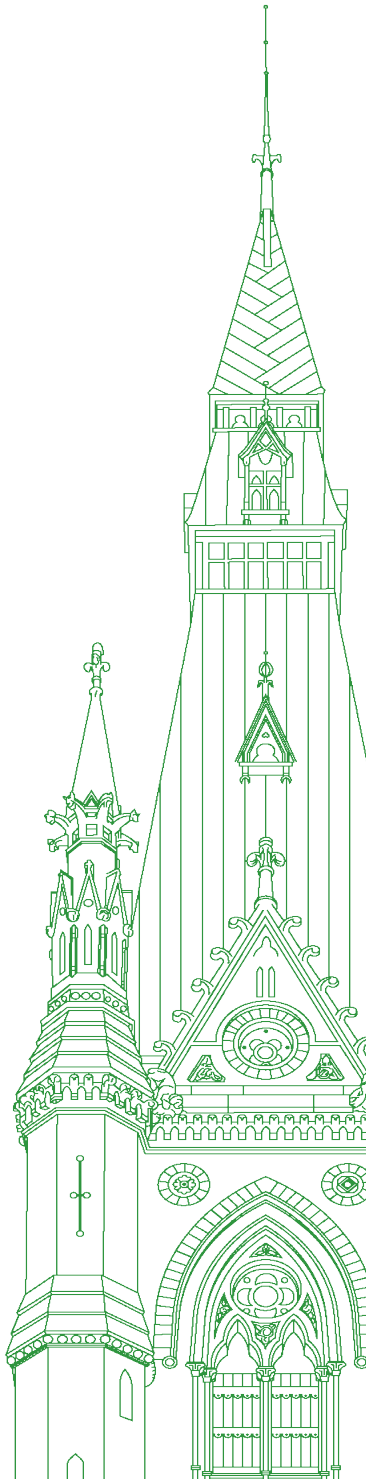

Chair: The Honourable Kirsty Duncan

Standing Committee on Science and Research

Tuesday, February 8, 2022

● (1830)

[*English*]

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

We are in meeting number three of the House of Commons Standing Committee on Science and Research.

Tonight, we have a few witnesses joining us. I'm excited to hear their presentations and look forward to the rounds of questioning later on this evening.

We are going to start with a six-minute presentation by Dr. Runte.

You have the floor.

[*Translation*]

Dr. Roseann O'Reilly Runte (President and Chief Executive Officer, Canada Foundation for Innovation): Good evening.

Established 25 years ago to stop the loss of Canadian talent to other countries, the Canada Foundation for Innovation, or CFI, invests in state-of-the-art infrastructure.

[*English*]

We thus enable researchers at Canadian universities, colleges and hospitals to think big, innovate and lead. The CFI is an independent not-for-profit organization operating at arm's length from the government. We invest, on behalf of the Government of Canada, 40% of the total cost of infrastructure projects, with the provinces's private and not-for-profit sectors covering the remaining 60%. This is an important contribution to nation building that creates at the same time a world-class research ecosystem.

Since its creation, the CFI has committed more than $9 billion for over 12,000 projects at 170 research institutions in 80 municipalities across the country. Adding partner contributions, this translates into over $20 billion. CFI investments have supported the emergence of fields of research as diverse as clean energy, quantum computing and precision medicine.

[*Translation*]

For example, the Centre d'optique, photonique et laser at Université Laval is at the heart of a new industrial sector focused entirely on the use of sophisticated lasers and comprising 70 companies and research centres. It employs over 3,000 highly qualified people in Quebec City.

[*English*]

We work collaboratively with the research granting councils, which fund individuals, while the CFI funds institutions. Growth in our largest research institutions means that Canada can rival the best in the world. The University of Toronto, UBC and McGill University rank among the top 50 in the world, demonstrating the talent, creativity and global reputation of our researchers.

The cumulative impact of our investments has the power to catalyze and transform the economy of regions. For example, vintners in British Columbia and the Niagara region depend on research to develop mould- and cold-resistant vines. The CFI was one of the first investors in the Perimeter Institute in Waterloo, then a largely agricultural region. Today, this extraordinary facility welcomes researchers from around the world and is surrounded by a prosperous high-tech community where quantum research is poised to break new ground in collaboration with researchers in Montreal, Sherbrooke and Vancouver.

The provinces have been central to the success of the CFI. When we consulted about the possibility of a biomedical research fund, they all wanted to make sure that their researchers were equipped to respond to future outbreaks of infectious disease and to lay the groundwork for a vibrant life science sector in Canada.

Today, we've learned that we must do more than collaborate internationally. At times, when borders close, we need to be independent and develop a supply chain that goes from ideas and discovery to manufacturing and the commercialization of innovation.

Nations around the world are investing hugely in research and pinning hopes on significant research investments for rapid economic recovery. Our neighbour to the south of the border encourages young researchers to take risks and to expect and learn from failure. In Canada, we do not have a sufficient population or resources to permit investment at such a scale, nor do we have the luxury of failure. We must invest wisely and continue to foster research through a combination of competition and collaboration, building networks and partnerships both across the country and globally. By creating opportunities for convergence among disciplines, for bringing together the diversity of our population and for the meeting of minds across our vast geography, we stand the greatest chance of success.

Canada is once again facing a shortage of skilled and highly skilled employees. There is a global race for talent and every effort is required to keep our best minds in Canada. We believe the solution lies partially within our borders. We recently conducted a national survey of youth to learn how they view science and what influences and shapes their attitudes and perceptions. The good news is that 70% said that science can be relied on because it is based on facts, not opinion. Even better, 77% think science is a good field to pursue as a career. We need to be sure they can follow this dream.

● (1835)

For the CFI, that means providing the spaces for learning hands-on research fundamentals and techniques, spaces where they'll be inspired and motivated to be like Donna Strickland, or Mona Nemer, or your chair, Kirsty Duncan.

There is also a message for all of us here tonight. Fifty-seven per cent of young adults believe it is critical for Canadian politicians and governments to rely on science when making policy decisions. I would like to recognize your leadership in supporting research that offers us not only real solutions to global problems but hope, which is perhaps the gift the world most needs to move from its postpandemic state to new heights of achievement.

Thank you for your kind attention. I look forward to your questions.

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

We will move to our next presenter before we open up the floor to questions.

Dr. Nemer, please start.

[*Translation*]

Dr. Mona Nemer (Chief Science Adviser, Office of the Chief Science Adviser): Thank you very much.

Good evening, Mr. Chair and members of the committee. Thank you for giving me the opportunity and the privilege to exchange with you this evening.

I would like to first congratulate you and all members on being nominated to this important committee, the creation of which is vital not just for the research community, but for our country's future.

Over the past two years, we have seen science in action like never before, as a new virus swept through countries and posed an existential threat not seen for a century. Science guided us throughout the pandemic and gave us the tools—from diagnostics to vaccines to therapies—that saved lives and are allowing us to return to a more normal state. Researchers raced to learn more about the virus and the disease it causes; their discoveries informed public policies in real time and generated unprecedented public interest in science, science advice and evidence-informed decision-making.

[*English*]

During this time, in my capacity as chief science adviser, I reached out to Canadian researchers who generously participated in many task forces and expert panels to help provide science advice to our government in support of pandemic management. This included advice on research needs, the role of aerosols in virus transmission, the impact of the disease on children and options for ongoing virus monitoring and early detection. Science and research will be needed even more in the postpandemic era to help us build healthy, safe and sustainable societies while addressing the challenges of mitigating and adapting to climate change. That is why the work of this committee is so important.

Since its inception in the fall of 2017, my office has been working toward fulfilling our mandate to provide advice to government on, first, improving support for quality scientific research, including guidelines for an open science ecosystem; and second, enhancing the science advisory function within government, including processes for science-informed decisions.

To these ends, we developed a model scientific integrity policy, which has now been implemented by 22 federal departments and agencies, along with a road map for open science, which has also been embraced by the research community within and outside government departments. We have recommended and helped develop a growing network of departmental science advisers that further enhances the science advisory needs of government.

If I may, I wish to recognize the invaluable support of the chair, Madam Kirsty Duncan, in her role as minister of science in helping set up this most useful network.

Additionally, my office participated in the creation of the interdepartmental indigenous STEM cluster, or I-STEM, which works to increase and expand support for indigenous priorities in environmental stewardship and research. We have been active in international scientific engagement, which greatly benefited our country during the pandemic.

● (1840)

[*Translation*]

My office will continue to provide science advice on issues that are critical to the welfare of Canadians, including emergency preparedness, climate change adaptation, advanced technologies, and research and talent development in key sectors.

[*English*]

The acquisition of new scientific understanding, its mobilization in technology innovation and its careful, appropriate and transparent use in government decision-making contribute to the welfare and prosperity of all Canadians. Over the years, we have enjoyed some noteworthy successes in diverse areas ranging from physics, computer sciences and engineering to life sciences and health, which has translated into digital technologies and health products, among other innovations. However, as many countries around the world increased their attention to and investments in research to drive their economies, Canada's relative spending on R and D has declined over the past two decades.

A 2018 report of the Council of Canadian Academies outlines how Canada is lagging other countries in research on most enabling and strategic technologies, and accounts for a relatively small share of the world's research output for promising areas of technology development, notably biotechnology, nanotechnology and materials science. This of course has a direct impact on our ability to create innovative products and businesses that generate jobs and prosperity.

Canada can still catch up to our peer countries that are forging ahead with big, bold visions for science and technology. We have the essential ingredients to do so with our talented people and our world-class facilities, but getting there means prioritizing science in our economic strategies.

[*Translation*]

The pandemic has already taught us many lessons: the importance of homegrown research, innovation and manufacturing; and the power generated when government, business, academia and civil society work collaboratively to advance science-based solutions.

Most of our peer countries are prioritizing research and innovation for their post-pandemic economies, creating a highly competitive environment for attracting and retaining talent and investments.

[*English*]

As we look to a future that will need even more science and research, we must set ambitious targets for our country and ensure that we have the appropriate environment and conditions to meet them. A thriving research ecosystem is foundational for talent development and discovery. It also enables the development of mission-focused R and D in priority sectors for our country, whether they be health, agriculture, energy or secure communications.

In summary, reaffirming our research prominence will result in socio-economic benefits for all Canadians. Science leadership will provide us with the tools to strengthen our international standing in an increasingly complex world. We need to bring science and technology innovation to the mainstream of our economic policies, and we need to enshrine scientific advice in our decision-making processes.

I look forward to assisting the committee in its important work ahead.

Thank you.

The Vice-Chair (Mr. Corey Tochor): Thank you very much for both of those presentations.

We're going to move into the six-minute round of questioning.

First up is Mr. Williams.

Mr. Ryan Williams (Bay of Quinte, CPC): Thank you very much, Mr. Chair, and thank you, Dr. Nemer and Dr. Runte, for being the first witnesses on the Standing Committee on Science and Research. It's very exciting.

Our future priority in Canada, our prosperity, if we're ever going to move away from oil, gas and mining, which is such a big driver of our GDP, is going to be innovation. It's going to be big, bold ideas and a sense of urgency that get us there.

Right now, we're ranked not near the top but somewhere near the bottom. The Trudeau and Paul Martin governments had wanted us to be in the top five.

My first question is for Dr. Runte.

How are we going to get to number five in this nation?

● (1845)

Dr. Roseann O'Reilly Runte: I think we have to make a concerted effort and invest. We need to invest, first of all, in the young researchers so that we have the next generation and the workforce that will bring business and attract economic development. We need to invest in cutting-edge research for the future. We need to continually upgrade what we have and make sure that our past investments continue to pay off. We need to support the top institutions that have the possibility of moving great global issues.

We also need to provide the ability for institutions across the country, smaller research institutions in the regions, so that young people everywhere in the country can have the opportunity to do what Art McDonald, who is from Cape Breton, did: get a Nobel Prize.

We have to provide opportunity across the country while we're supporting the absolute cutting-edge research in some institutions, and we have to maintain what we have already while we're acquiring more.

Mr. Ryan Williams: Thank you very much, Doctor.

My favourite country for innovation is South Korea. South Korea fits into the rock of Newfoundland and yet produces the same GDP as we do. Half of their GDP is innovation, so Samsung, LG, Hyundai.

The U.S. right now is in front of us. What I'm getting from you is that we need to have innovation in innovation.

Dr. Nemer, the U.S., for instance, has come up with a new energy earthshots initiative. They have clear targets where some of the most technological problems are solved. Right now they're doing hydrogen economy, battery long-term storage and removing greenhouse gases from here. Yesterday they announced a geothermal project.

Should Canada develop not just a CARPA, but a U.S.-style earthshots initiative to get ahead of the pack so we can become better at innovation in this nation?

Dr. Mona Nemer: I think your observations are extremely important. We need to look at these countries in terms of what they invest in basic research, how they facilitate the translation of research into innovative products and also the makeup of their economy where they have many more companies that are actually in the private sector that do research in those countries.

When I last looked at South Korea, their investment in research is absolutely incredible and the slope that keeps going up. There's also the whole supportive culture, because you have the LGs and the Samsungs, and they can collaborate and help basic researchers in institutions and so on.

I think for us, we need to create this environment. Yes, we do need to have high ambitions. We need to decide that we are going to have our own moonshot projects based on our needs, our capacities, our competitive advantage, and go after it in a determined and systematic way.

Mr. Ryan Williams: Thank you. I'll go to my last question.

Dr. Runte, should we be mirroring what the U.S. or our competitors are doing for innovation, or should Canada be coming up with its own differentials, let's say, food processing or some other technologies that we can be more competitive in?

Dr. Roseann O'Reilly Runte: That's a really great question. I don't think it's simply looking at technology that doesn't exist where we're going to fill a gap. I think we have to take where we have talent, where we have already developed ability, what coincides with our culture and our ability. There's no point in us developing tropical bananas or something. We have to look at what we have here in Canada. What do we have? What are our talents? What are our strengths?

Part of what we do in the Canada Foundation for Innovation is test that. We hold competitions and look at where we have strength. In 1990 before anybody knew the term “artificial intelligence”, we were funding those researchers who created what we now have in artificial intelligence. When we invested in the Perimeter Institute in Waterloo, there was nothing there. It was farmers fields. Yet there were the people who had the ambition and the goal and the drive to do it.

I wouldn't have picked Waterloo—perhaps the mayor of Waterloo wouldn't like this—as a site for that, but it was brilliant, and everything has grown around it. We have to look at the people we have, the need and also the global need, and then we will find our abilities and our niche, and we will be very competitive. We've shown we can do it. In precision medicine, we are very highly ranked in the world. There's artificial intelligence. We've done quite well in quantum, but we have a lot more way to go.

We're looking at what we do for clean technologies across the country. We can build in that area, but we need to take the grassroots and bring them up. That will be our strength, because I truly believe that our strength and our best resource are the minds of the people across this country, and they will be the key.

● (1850)

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

We're moving to Mr. Collins for six minutes.

Mr. Chad Collins (Hamilton East—Stoney Creek, Lib.): Thanks, Mr. Chair.

First and foremost, thank you to both doctors for presenting tonight. It's a great inspirational kickoff to the first study. Thanks again to Member Cannings who put this study in front of us to get us to where we are this evening. It's a terrific start to what we're doing.

I want to start with Dr. Nemer's opening statement. Something in her speech caught me. She said, “Science and research will be needed even more in the postpandemic era to help us build healthy, safe and sustainable societies while addressing the challenges of mitigating and adapting to climate change.”

That caught me, Dr. Nemer, through you, Mr. Chair, because I think that 90% of Canadians agree with your statement.

How do we ensure that government policy continues to rely on science and to be guided by science, whether it's on health-related matters, which have dominated, obviously, our discussion over the last two years with the pandemic, or any other government programs in other ministries?

How do we ensure that we, as a government, continue to rely on science and that science is front and centre in the decision-making process, rather than what we have seen from a very small, vocal minority of people who rely on social media?

You can surf Facebook, YouTube, Twitter, or any of those platforms. We have found that those who don't rely on science are questioning climate change. They are questioning the vaccines. There is literally a flat earth society out there now.

How do we collectively, at all levels of government, deal with that issue from an education perspective and from an investment and funding perspective to ensure that it remains a small minority?

Dr. Mona Nemer: Mr. Chair, this is such an important and, of course, complex and complicated issue.

Mr. Chad Collins: Take as much time as you need, Dr. Nemer.

Dr. Mona Nemer: Thank you very much.

I think you're right that this is a societal issue that has to be taken on by our governments, our scientists, and our media, for that matter. This is something we need to be doing for the collective good.

I often say that science and science literacy are so essential for democracy. Science is everywhere. People make decisions every day based on science without even realizing it. When they don't understand the science or when they are influenced by folks who have all sorts of ulterior motives or not in a particular area, then I think we all suffer.

On the hopeful side, we have seen during this pandemic that many of our scientists, researchers and physicians stepped up and were engaging with the media and directly with the public. I am gratified by seeing how the public's appetite for science and evidence is increasing. The public is demanding to understand the evidence on which some decisions are being made. I think that's a very positive development and one we need to continue to nurture. There are many ways that can be further helped, but I feel that we are on a good track for that.

Of course, we ask scientists and researchers to do many things these days. We ask them to talk to the public. We ask them to do their research, to train the next generation and to start companies. I think all these are very important, but we need to recognize their efforts when they engage with the public.

Dr. Runte spoke about artificial intelligence and quantum sciences. These are going to be transformative tools for us to tackle health and environmental adaptation, but we're going to need the public to come along with us, so it's very important to engage with the public.

I'm proud to say that I have taken on bringing scientists and parliamentarians together as a priority for my office. We will be doing another edition of Science Meets Parliament and I hope all members of the committee will be part of this very important exercise.

● (1855)

Mr. Chad Collins: Thank you, Doctor.

Normally I don't comment on other countries' domestic policies, but ours seems to be a topic of interest to our neighbours. I'm concerned about what we see in the U.S. in terms of government decisions at times not guided by science and guided by other information.

How do we deal with that postpandemic? How do we deal with it from an education perspective? I think Dr. Runte says 57% of youth suggested that we continue to be guided by science, which is a bit of a concerning number. I thought it would have been a lot higher—unless I misheard that.

How does the government make investments to ensure that the vast majority of Canadians continue to believe that policies at all levels of government should be guided by science? How do we implement that from a funding perspective and an education perspective?

The Vice-Chair (Mr. Corey Tochor): I'm sorry, Mr. Collins, but we're just up to six minutes. As much as the last one went a little longer, we are going to try to keep to the schedule.

Mr. Chad Collins: That's no problem. Thanks, Mr. Chair.

The Vice-Chair (Mr. Corey Tochor): It's much appreciated.

Moving along to the next member, we have Mr. Blanchette-Joncas.

[*Translation*]

Mr. Maxime Blanchette-Joncas (Rimouski-Neigette—Témiscouata—Les Basques, BQ): Thank you very much, Mr. Chair.

Ladies and gentlemen, it is with great pleasure that we welcome you this evening to discuss science, research, success, challenges, and opportunities. Allow me to address my first questions to Ms. Nemer.

Ms. Nemer, first of all, I would like to put into perspective the role of your position as Canada's chief science adviser. This position existed from 2004 to 2008, but then it was abolished by the government, only to be reinstated in 2017. So for almost 10 years, there was no chief science adviser position.

What do you think has been the effect of the absence of this position on government policy and on society as a whole?

Dr. Mona Nemer: It's hard for me to say what happened when I wasn't at the table, but I can only imagine what we missed. Having said that, I can tell you what has happened since I have been in office.

For example, during this pandemic, it was clear that the position I hold was a very important one. I have been able to work with various government departments, as the multidisciplinary objectives of science cut across several departments. In addition, this position provides us with important links, both domestically and internationally, which have served us well.

I guess it's important to have a chief science adviser position if most of the big countries have one, so that you can be at the table and benefit from what others are doing well, to adopt best practices.

Obviously, there is a lot of work to be done and my deepest wish is that we can have a sustainable science advisory system in this country, a bit like England, and even the United States, which have had well-established systems for over 50 years.

● (1900)

Mr. Maxime Blanchette-Joncas: Ms. Nemer, Quebec has enshrined the position of chief science adviser in the Loi sur le ministère de l'Enseignement supérieur, de la Recherche, de la Science et de la Technologie. As I understand it, Canada's chief science adviser position does not have equivalent protection.

You mentioned the importance of having a chief science adviser to accompany the government in various aspects of science and research.

Wouldn't the fact that your position is enshrined in legislation represent not only a voice for scientists, but also the inclusion of science in government decisions?

Dr. Mona Nemer: Indeed, this observation is very interesting.

Quebec often leads the way. Right now, to tell you the truth, I envy my colleague, with whom I have been in contact throughout the pandemic. I think it is certainly in the country's interest to ensure that a position of this nature exists on a permanent basis. Obviously, if it needs to be enshrined in legislation, that's a decision for parliamentarians, not for me. But I can tell you that many of the scientists and of our international counterparts would welcome it.

Mr. Maxime Blanchette-Joncas: Thank you very much, Ms. Nemer.

I obviously want to ask you a question related to the pandemic. You mentioned it in my first question.

I am trying to understand why Canada, a G7 country, is the only one that has not been able to produce vaccines, and therefore has not been self-sufficient in producing the COVID-19 vaccine.

Dr. Mona Nemer: Producing a vaccine is obviously not an overnight process. Vaccines have been produced by consortia of universities and companies whose work has been going on for some time. First, a potential vaccine is developed and then it is produced.

In the case of Canada, it was clear that we did not have the capacity to produce vaccines in large quantities, as our facilities were very limited for this type of production. Moreover, these facilities were already being used for the production of other vaccines, including for influenza. I think we have learned our lesson. I think the government has taken note, given the investments it has made in vaccines and therapies.

I believe that, in the coming years, we must not forget the trauma we have experienced. In other words, we cannot take a piecemeal approach. We will have to make a serious commitment to health security and continue to do so.

● (1905)

Mr. Maxime Blanchette-Joncas: Thank you, Ms. Nemer—

[*English*]

The Vice-Chair (Mr. Corey Tochor): Thank you very much. That's six minutes.

[*Translation*]

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

[*English*]

The Vice-Chair (Mr. Corey Tochor): We're now moving to Mr. Cannings.

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

Thank you both for being here tonight. It is a historic occasion to have a committee on science and research in Canada. It's wonderful to be here at the initial meeting and to have two people such as yourselves before us. I wish we had hours and hours to talk to you.

I met with Dr. Runte a couple of weeks ago, so I'm going to start with Dr. Nemer. I have so many questions here.

Both of you talked about the competition in terms of science and young scientists that Canada has with other countries, the amount of investment in the U.K. and the U.S.A. The U.S.A. is putting out an idea for $250 billion in science and research investment.

When I talk to young scientists, especially in fields that require a large amount of expensive equipment—and this refers to Dr. Runte's field—they are drawn inexorably to the United States because there's just a very limited amount of that in Canada.

Dr. Nemer, you mentioned that Canada had to prioritize science in our economic strategies. I translated that as meaning we have to spend a lot more money. I wonder if you have any ballpark figure there. Would one-tenth of what the U.S. is planning on spending, $25 billion, be what we need to do, perhaps over a number of years? What would make the biggest impact to get Canada on the right track where the federal government is actually putting a good amount of money into science and research that will drive our economy forward in these years?

Dr. Mona Nemer: Mr. Chair, Canada is a member of the G7. We are a developed country. We are one of the greatest countries in the world. I think it would be expected and normal for Canada's investment in discovery and innovation to be above the average of similar countries, whether they are G7 or OECD countries. Therefore, we do have a rough target there and we need a path towards that target.

That said, in terms of keeping the young researchers and scientists in Canada, we need to recognize that we have to create for them diverse job opportunities. They're not all going to go to universities. In fact, even the majority of Ph.D.s don't end up being university professors. What we need to have more of in the country are science-based industries and a science-based economy. Just because we are rich in natural resources doesn't mean we can't do it. In fact, many of the latest technologies, whether AI, robotics or quantum, can have an amazing effect on our sectors, whether it's agriculture, natural resources or even mining.

It's a combination of both. Once we have these industries, these innovative industries, they themselves also will be investing in research and will help pull us up again.

Mr. Richard Cannings: You just mentioned a rough target in relation to the G7 or OECD. I assume that's in ratio to GDP.

Do you have an idea of what that rough target might be, where we are or where we should be?

Dr. Mona Nemer: I have looked recently. I'm sorry, I don't remember exactly where we are, but it has been mentioned that we are not in the position where we want to be.

I'm more than happy to provide the committee with these exact numbers afterwards. I'm sorry, but I don't want to be misquoted.

Mr. Richard Cannings: It would be great if you could provide us with those numbers.

Dr. Nemer, with the luxury of having you in front of us, maybe this is an unfair question, but I wonder if you could comment on this idea.

You're the science adviser. There was also a proposal put forward for a parliamentary science officer who would give advice to parliamentarians such as ourselves, not just the cabinet and the government. What do you think of that concept? Do you think it's a valid one? Would it be too unwieldy?

I'm really interested in hearing your opinion.

● (1910)

Dr. Mona Nemer: Well, you know, the more science advice we have, the better. There are a number of models out there. For example, in the U.K., there is a parliamentary office that provides science advice and there is a government science adviser as well and things work quite harmoniously.

We can look at the models that exist out there and adapt what we feel is best for us. Science is going to be important everywhere, and certainly all decision-making and parliamentarians would most likely benefit from something like this.

Mr. Richard Cannings: It looks like my time is up, so thanks very much.

The Vice-Chair (Mr. Corey Tochor): Thank you, Mr. Cannings, for being right under the six-minute mark. Good job.

Moving on to the five-minute round, we're going to Mr. Soroka.

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

My first question is for Dr. Nemer.

We've talked about the brain drain. I have to admit that my family is no different in this situation, because I have two nephews who are actually going to university in the United States right now. They both started at the University of Alberta, but now one is getting his Ph.D. and the other one is getting his master's degree in business.

Is it really only funding or is it also that the facilities we have are lacking as well, or is it a combination of both?

Dr. Mona Nemer: I'm going to start by saying that it's not a bad thing for young people to go and study abroad, train abroad or even work for short periods of time abroad. However, we definitely want to have them back in Canada and we want them contributing to the country.

As I said, there are opportunities that already exist in Canada, but we must create more of them and that can only happen by having different sectors work together. This includes the government, the private sector and academia. In places like Silicon Valley or Boston that are thriving with a science-based economy, this is exactly what we saw happening; these different sectors came together and each did what they needed to be doing to put forward the best ecosystem possible.

Mr. Gerald Soroka: I like your comments but, unfortunately, they both have American girlfriends and I don't see them coming back too quickly. But that's another story.

Dr. Runte, my question is whether there are areas that we're missing out on in research, or areas that aren't getting funding because they don't fit some criteria. Is it pretty much an open field, where there are no bounds and it's just the lack of money to fund them?

Dr. Roseann O'Reilly Runte: First of all, you can ask your nephews to be Canadian recruiters and bring their girlfriends to Canada.

There are always areas that we are discovering, just like we're discovering new knowledge, and those areas of discovery are quite often between disciplines. When we bring disciplines together, we get an exchange of different ideas and perspectives. Questions become more richly considered and developed, and the product of the research is better.

When you try to build a model, for example, on the computer simulating a problem, you can build a very simple model and it will give simple answers, but the answers that you need are actually very complex. You need not just consider, for example, that a road would be built ergonomically, but that it should be environmentally and economically done, and it should be done in a way that's culturally supportive of the people's needs. That way you get a road that's really good. When we bring researchers together, that happens.

One of the things we are doing more and more in Canada is creating environments where there's not just the collision of atoms but the collision of minds and people sharing ideas to make new discoveries. That's really exciting and it's happening right across the country.

Recently I've heard about artificial intelligence mixing with agriculture, artificial intelligence mixing with medicine, neuroscience, oceanography mixing with nanoscience. There are all sorts of new possibilities that will come from this collaboration and bringing together of new ideas and people.

● (1915)

Mr. Gerald Soroka: Thank you, Dr. Runte.

I'm short on time, but I have a quick question. Is there something very cutting edge that we're completely missing the boat on here in Canada that other countries are picking up on and that we could research more?

The Vice-Chair (Mr. Corey Tochor): You have a quick 30 seconds.

Dr. Roseann O'Reilly Runte: Absolutely, there are things that we're missing out on, but there are also.... If we told everybody right now, the other countries would jump on it tout de suite. I could provide you with a long list of things that I think we need to develop, but I also believe we will develop them if we give the opportunity to the researchers, and if we provide the basic tools to labs and equipment to researchers, universities and hospitals, people will come together and find those things.

In every one of our granting competitions we ask people: How will your work help Canada and Canadians? What will this do for the country? We think that's important.

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

Moving on, we have Madam Diab for five minutes.

Ms. Lena Metlege Diab (Halifax West, Lib.): Thank you very much, Mr. Chair.

It's really wonderful to be here with both doctors at this historic committee, in our first meeting.

I want to talk about something that struck a chord with me, Dr. Nemer. It was when I heard you mention the power generated when government, business, academia and, I guess, private enterprise—I think you said "civil society"—work collaboratively to advance science-based solutions.

Then when I heard Dr. Runte say "Art McDonald", "Nobel Prize", "Cape Breton"—of course, I come from Nova Scotia, a small province in Atlantic Canada—it goes to show you that it doesn't matter where we are in Canada, research happens everywhere, but it's also the power of collaboration.

Having spent eight years in provincial politics before coming to federal, I see the real advantage of collaborating, not just between the levels of government but, quite frankly, with academia, our universities, colleges and students, whether international or our homegrown sons and daughters—I have two who are scientists—but also with private enterprise.

Dr. Nemer, what more can we do to enrich this culture of collaboration that I think is desperately needed in order for us to be able to gain a lot more momentum in this country for research and science?

Dr. Mona Nemer: I so strongly believe in collaboration. I think it has to be our mantra, so to speak. Depending on with whom you want to be collaborating, of course, the incentives and the facilitations are very different. Governments have huge tools to facilitate collaboration with specific sectors, between academia and businesses, as well as supporting civil society and communities that want to do research and collaborate as well, based on their local needs and local capacities, and growing those capacities.

It's difficult to provide specific tools, except to say that governments have a number of things. If they wanted to have more businesses develop certain products, they are great buyers. There are procurement things that can be done, and of course taxation and regulations. There are infinite possibilities. Governments are facilitators. I think the expectation of the citizens of this country is that all levels of government will work together and work with the communities and researchers themselves.

In this pandemic, we saw how the researchers were willing to step up and be very generous with their advice and their time. Many of them pivoted to doing research in areas that are needed by our country for the pandemic. I'm very hopeful on those fronts.

● (1920)

Ms. Lena Metlege Diab: Thank you.

This is for either one of you.

We have first ministers conferences on many topics in government. Are you aware of a ministers conference on research that happens between the federal and provincial governments? Are there opportunities for either one of you to be involved in things like that, in terms of assisting the federal government to proceed with that? In your role, do you assist academia at all on behalf of government?

Dr. Mona Nemer: Maybe I can start.

I'll say that I see my role as a conduit and a convener between academia and the government. To the question of a first ministers conference on science and research, it was one of the recommendations of the fundamental science review. I'm not aware, but I have to say that before being in this role, I didn't follow the politics really.

Beyond having a first ministers conference on [*Technical difficulty—Editor*].

The Vice-Chair (Mr. Corey Tochor): We might have a technical problem.

Dr. Nemer, we're out of time on that round.

Dr. Mona Nemer: [*Technical difficulty—Editor*] ought to be an integral part of these conversations.

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

Technology issues happen to the best of us from time to time.

We are going to move into the next round of questioning, of two and a half minutes.

First up is Mr. Blanchette.

[*Translation*]

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

My question is for Ms. Nemer.

Ms. Nemer, I have assessed your responsibilities. In the description of your mandate, it says that you are to assess and recommend ways to improve the science advisory function within the federal government.

We also know that the Naylor report recommended the creation of an independent national advisory council on research and innovation. This was implemented in 2019 and people were recruited, but we have not heard anything further from the government afterwards.

Do you know the status of the implementation of this council?

Dr. Mona Nemer: I'm sorry, but I don't know.

Mr. Maxime Blanchette-Joncas: Okay.

In your last report, published in February 2020 and entitled Roadmap for "Open Science," you recommended that Canada adopt "an Open Science approach to federally funded scientific and research outputs."

Can you tell us about the progress made since the publication of your report?

Dr. Mona Nemer: I am happy to answer this question, especially as we have just published online yesterday the results of our consultations with scientists and researchers, but also with those who fund research in Canada and abroad.

We are making good progress on the "Roadmap for Open Science." Within the federal government, we asked that the various departments each have an action plan. They now have all had action plans for six months, and several have even posted them.

We now need to think about developing a countrywide approach, both inside and outside government. We are currently working on how best to do this in an internationally harmonized way, as most of the grants for coordinated research come from several places.

There is certainly a lot of support for open science from researchers across the country.

● (1925)

[*English*]

The Vice-Chair (Mr. Corey Tochor): Thank you so much, Dr. Nemer.

We're moving to Mr. Cannings.

Mr. Richard Cannings: Thanks. I will stay with Dr. Nemer for this quick round.

You mentioned in your opening remarks that one of your priorities was to create and/or cultivate an open science ecosystem. Could you expand on that and let the committee know what an open science ecosystem is?

Dr. Mona Nemer: Open science, of course, involves a number of things. It's open publications. It's open access to data. It's the ability to openly engage with the public. There are different dimensions.

Towards those objectives, my office recommended the adoption of a science integrity policy, which was done by all major science-based departments and agencies, and there is the commitment to open science and to open data.

The first phase was to do the open publishing, because that's the easier part, and then move on to having the majority of the data that is within the federal government, whether it's observational data or research data—of course with exceptions that we have also provided guidelines on—be open as well.

The Vice-Chair (Mr. Corey Tochor): Mr. Cannings, keep your question brief, please.

Mr. Richard Cannings: I have a quick question for Dr. Runte.

Could you, in very short order, explain how your role at CFI differs from the other three granting councils of the federal government?

Dr. Roseann O'Reilly Runte: The three granting councils are part of the government; we are at arm's length from the government. We fund the research infrastructure; they fund the people.

We provide the infrastructure to institutions, because when you purchase a piece of infrastructure or you build something, an individual researcher can't do that. It has to be done by an institution. Also, we provide only 40-cent dollars, whereas the councils provide more.

If we provide 40-cent dollars, it means that the provinces have to come in and be persuaded to put in 60%, or another 40% and then 20% from perhaps private enterprise or institutions.

You can't have hundreds of researchers doing that. Institutions have to take that on.

The Vice-Chair (Mr. Corey Tochor): Thank you so kindly.

We're going to move to Mr. Baldinelli.

Mr. Tony Baldinelli (Niagara Falls, CPC): Thank you, Chair, and thank you to our witnesses for being here today. It's a pleasure to have you as our first witnesses on our new committee.

I want to begin with Dr. Nemer and follow up on a conversation that my Bloc colleague had put forward with regard to a national advisory council on research and innovation. It was one of the recommendations of the Naylor report that has yet to be followed up on by the government.

You talked about the ecosystem foundation being critical to science and research and innovation moving forward. We don't have that research and innovation advisory council. Do you believe it is key to helping develop that ecosystem?

Dr. Mona Nemer: Well, different countries of course have different variations of these science and technology councils or other designations. They're helping in providing strategic advice to government in terms of either areas that need further attention or specific activities. Usually they have people from the private sector, as well as from academia and government, so they're generally viewed as very helpful.

During the pandemic, I put together an expert committee to advise us on the important areas for science and actions for the pandemic. You could do it by sector or you can have one that looks at the broad ecosystem for the country.

● (1930)

Mr. Tony Baldinelli: Thank you.

Just to follow up, the mandate letter for the Minister of Innovation, Science and Industry that was published in December indicated that he:

> work with the Minister of Health to develop a plan to modernize the federal research funding ecosystem to maximize the impact of investments in both research excellence and downstream innovation, with a particular focus on the relationships among the federal research granting agencies and the Canada Foundation for Innovation.

It seems very similar to one of the recommendations, I think it's recommendation 4.10, that the Naylor report talks about.

Therefore, are we tending to say that the system in place right now is too bureaucratic? Is it too cumbersome for those stakeholders that we're dealing with in their relationship with government to undertake the research and those scientific projects that we ultimately need?

Dr. Mona Nemer: We have a system that has served us well over the years, but again, it's not perfect and it needs to keep up with the way science is developing and also the needs of the country in terms of translating discoveries or focusing on specific areas.

I think every business every now and then looks at how they're doing business. Sometimes they find out that they're doing great and other times they tweak what they're doing. Other times they remove certain activities and other times they add some. My understanding would be that such a self-evaluation is not a bad thing.

Mr. Tony Baldinelli: Thank you, Doctor.

I think that's time now.

The Vice-Chair (Mr. Corey Tochor): Thank you kindly for the presentations and the answers that you have provided.

We will suspend the meeting for two minutes to do sound checks on the next panel.

● (1932)

_____(Pause)_____

● (1935)

The Vice-Chair (Mr. Corey Tochor): Welcome back everybody.

We will hear first from Dr. Pomeroy.

Dr. John Pomeroy (Distinguished Professor and Canada Research Chair, University of Saskatchewan, As an Individual): Thank you so much.

It's a great pleasure to be speaking to this committee. It's a great pleasure that there is such a committee for Canada. It's absolutely marvellous to focus on science and research.

I'll introduce myself briefly. I completed my graduate and undergraduate training in water sciences at the University of Saskatchewan in Saskatoon. I then worked for NATO and the U.S. and Canadian governments as a research scientist, and then at the University of Wales in Aberystwyth in the United Kingdom. I was attracted back to Canada in 2003 by a renewed science and research strategy that led to the Canada research chairs program and a substantial increase in tri-council funding for academics.

This made Canada a warm welcoming place where one could more confidently pursue large-scale, world-class research. Since that time, I've led or co-led five national research networks and some international initiatives. I conduct research on water, particularly the impacts of climate change on water resources of cold regions such as Canada, where snow and ice are vulnerable to the warming temperatures.

I come from Saskatchewan and the prairie provinces, where drought is always on the horizon. We even have dust storms occurring in the Prairies this week. It's a massive issue for the west. How we manage, predict and steward that water, how we understand it and make sure it's available for our ecosystems, communities and indigenous communities for food production, industry and energy is a very important issue for us.

Over the years, I've observed Canada building up a really enviable system of supporting and encouraging university-based science and research. The dependence on university researchers for science production in Canada has grown. I started off as a government scientist, but I wouldn't want to be one right now as budgets have declined over the decades.

It's better at the universities. However, there's a risk to this dependence on the universities as it's structured right now. We lack the long-term means to sustain our national prominence in research areas. Other countries have these mechanisms in place.

Here's what I mean: In the UK, NERC centres combine academic and government research on strategic topics over long periods of time—decades. In the United States, there are co-operative institutes between the federal government and universities that function over decades and sustain long-term research objectives. In Canada, we don't have this.

My colleagues and I have worked on issues of water, climate and water pollution since the early 1990s. It's been made even more pressing by climate change. We found that we've had to establish six different research networks across the country to do this with five different research funding agencies. We call ourselves “acronym surfers” because every five years or so, we have to reinvent ourselves a bit. We have to learn a new funding agency and we have to bring in new sources of support for this.

It's precarious. It's also inefficient and takes long periods of time. It's a great worry. We know that water is life. We know that Canada depends on water. We can go back to John Palliser's expedition in the 1850s where this first came to prominence as a government report. This is something that should be straightforward moving forward.

Right now, the network I lead is called global water futures. It's funded by the Canada first research excellence fund, which has a marvellous amount of funding for science research. It's based at the University of Saskatchewan in partnership with Waterloo, Laurier and McMaster universities. It funds over 200 professors at 18 universities. We've hired 1,100 students and researchers to transform Canada by finding ways to better forecast, prepare for and manage our future water in the face of dramatically increasing risk.

Global water futures is positioning Canada as a global leader for water science and we work throughout the world. However, after a seven-year run, global water futures will end next year like any CFREF network and there are no renewals. There are no similar large science funding programs that could sustain our refreshed global leadership in water science in Canada.

● (1940)

This is a precarious position indeed. I propose a solution to acronym surfing and research instability like this; not more big chairs to bring in people from outside of Canada to do things at the end of their careers, but sustained collaboration between the federal government and universities to develop our own co-operative institutes between consortia of research universities, federal government departments, provinces, industry, communities, first nations and other partners. These co-operative institutes would sustain a long-term focus on issues of long-term national importance, and bring to bear our national scientific resources, our laboratories, on these issues to sustain big science and global pre-eminence in strategic areas of particular benefit to Canada.

In the area of water, perhaps the upcoming Canada water agency could be a federal facilitator and leader for this, along with the natural science departments, tri-council agencies, CFI and others, like a Canadian co-operative institute in water sustainability with the universities. I'm sure there are many other worthy topics of this long-term strategic support in collaboration between federal science departments and universities across this country.

We could stop acronym surfing and get down to answering the really dangerous and scary questions that we have right now, such as how we predict and prevent floods, droughts, the poisoning of our Great Lakes, the decline of our fisheries, safe drinking water for our indigenous communities and other problems.

I'll wrap up there and I look forward to taking questions from you. Thank you for having me here.

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

Now we'll move to Dr. Patry.

Dr. Gilles Patry (Executive Director, U15 Group of Canadian Research Universities): Thank you, Mr. Chair.

[*Translation*]

Let me start by saying how pleased I am to have been invited to speak to you today about the importance of science and research.

I am here as the executive director of the U15, an organization that brings together many of Canada's leading research universities.

The members of the U15, the Group of Canadian Research Universities, are responsible for 78% of the research, 81% of the patents and 70% of the PhDs in Canada.

[*English*]

Around the world, innovation-driven ecosystems are anchored by world-class research-intensive universities that are training tomorrow's leaders and innovators. Innovation is about people. Innovation is about making the world better. Innovation builds on basic curiosity-driven research to make things better for the benefit of society.

[*Translation*]

This pandemic has shown us the power of research, the need to persevere and the importance of innovation.

For many years, messenger RNA technology, which is the basis of the two most popular vaccines, was going nowhere.

● (1945)

[*English*]

The challenge was how to get the fragile strands of RNA through the cells. It was an almost insurmountable challenge, until a Canadian company from the University of British Columbia developed a lipid coating that forms a protective envelope around the RNA when it enters a cell. It's a Canadian university-based innovation resulting from years of fundamental research that is now used in one of the mRNA vaccines.

As we begin to emerge from the pandemic, Canada faces increasing competition for the talent needed to drive high growth, knowledge-intensive industries, address global challenges and build an equitable, inclusive society. Canada has many advantages in this competition, including a welcoming society, an open immigration system, vibrant cities, proximity to the U.S. and strong, world-class research universities.

Industry leaders will tell you that the crucial building block for success is having access to highly qualified people with advanced degrees, because they are tomorrow's generators of new knowledge and the drivers of innovation in companies and social enterprises across the country.

[*Translation*]

However, it should be noted that Canada ranks 28th in the OECD in terms of the number of master's and doctoral degrees.

[*English*]

When you invest in research, you invest in people—you invest in young people—and research investments made by successive governments over the past 20 years have certainly contributed to our quality of life. However, we need to be a lot more ambitious. Countries around the world are making massive investments in research and talent development at a scale never seen before. Canada will need to invest strategically in research, innovation and skills development, to ensure we continue to be economically competitive and able to equip Canadians for the jobs of the future, and remain a destination of choice for highly talented people from around the world.

In addition to the investments that are being considered right now, that is, the expansion of the CRC, the biomanufacturing investment, CARPA, commercialization investments etc., we need to make an important investment in the granting councils. When we look at inflation-adjusted research investments per Ph.D. over the last 20 years, it is very easy to demonstrate that Canada has a serious research funding deficit when compared to the period between 2002 and 2008. Now is the time to address this gap, to place Canada as a strong leader in science and technology and social science research.

In making these investments in research and innovation, governments need to consider two things. Number one is the need to be globally competitive. If we are to retain and attract the best minds in the world, it is important that our programs be globally competitive. Some of us have lived through the brain drain of the 1990s, and while we're not there yet, as we come out of the pandemic, the investments made by countries around the world are threatening our ability to attract and retain exceptional researchers.

The second thing is to remember that research, as I said, is about people. Research is about investing in the leaders and innovators of tomorrow in order to improve the lives of Canadians. It's also important to remember that close to 80% of the research funding goes directly to support students and post-docs.

Allow me to conclude by citing a paragraph from the 2014 Government of Canada budget plan.

To be successful in this highly competitive global economy, Canada needs to continue to educate, retain and attract the best minds in the world, to provide them with the space and facilities for innovation and creativity, to offer them the resources necessary to place Canada as a strong leader in science, technology and social science research.

Thank you very much. I'll be delighted to answer your questions.

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

It's now time for our final presenter tonight, Dr. Goel, for five minutes.

Dr. Vivek Goel (President and Vice-Chancellor, University of Waterloo): Thank you.

It's wonderful to see this House of Commons committee being established. Congratulations to all of you on your appointments.

Thanks for the opportunity to appear this evening.

I'm a public health physician researcher, and prior to my current appointment, I spent a year directly working on the pandemic research response. I was one of those people who pivoted, not just in my research but actually in my administrative career.

We only have to look at that response to see the return on investment in science and research, and Dr. Patry has just highlighted one very important example. Scientists, researchers and public health experts have played critical roles in advising and leading the response, from sitting on advisory committees to pivoting their research to COVID-related studies.

It's the support for fundamental research over many years that provided the foundation for that expertise to be there when we needed it. We certainly think a lot about the contribution of science to the response, such as the development of vaccines and treatments, but there are so many other areas. For example, social scientists have played a role in addressing vaccine hesitancy, economists in assessing the impact of pandemic measures, and medical geographers and historians in understanding past pandemics, such as this committee's chair has done.

Canada's support for science and research has yielded some very crucial competitive advantages, notably in quantum and AI, but as you have heard, we are at risk of falling behind other countries. Stable research funding is essential, but we also need stable programs. As Dr. Pomeroy has noted, new programs are constantly created with new acronym soups. These programs are often designed with the legitimate desire for impacting on pressing issues or contributing to the economy, but the design of the programs often misses the importance of fundamental research. We often focus on narrow research areas, and we push specific types of partnerships.

● (1950)

The reality is impact is achieved through broad interdisciplinary work, through partnerships and collaboration and through knowledge mobilization. That knowledge mobilization happens most significantly through the talent we produce, the master's and Ph.D. graduates who take their research experiences out into society. Our research also impacts on policies and practices, and we have an impact through commercialization.

All too often we jump straight to commercialization as the sole means of impact. It's also important to recognize that for commercialization to be successful, we need receptors, and as has been noted, our business investment in research and development is very low. Without that kind of capacity on the business side, we won't be able to get the innovations.

In the Waterloo region, we have developed examples of how this can work. My university is a leader in areas such as quantum, cybersecurity, nanotechnology and robotics, and this has benefited from many decades of investment by governments. However, we are also working to apply many of these technologies and digital strengths with entrepreneurs to new innovations. The region has built an ecosystem that is fostering the further development and application of such technologies. We can apply these technologies to our biggest challenges such as climate change or the aging population, or preparing for future pandemics.

Waterloo is one of the fastest-growing regions in the country, largely because of the innovation ecosystem that is underpinned by world-class research. We are well positioned to continue to help drive our economic renewal and growth.

As we look to move forward past the pandemic, building a country of innovative, equitable and resilient communities with an eye to environmental sustainability, health and wellness and technologically advanced societies, universities and our research have a central role to play. We look forward to working with the committee to advance these goals.

Thank you.

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

Now we are on the six-minute round of questioning, and we'll have MP Williams.

Mr. Ryan Williams: Thank you very much, everyone, for joining us tonight.

Mr. Pomeroy, I'm going to start with you.

I come from a rural region of Canada. Saskatchewan is very rural, as is Canada. Of all the 4,000 municipalities in Canada, 3,790 are rural. Of the rest, only 94 are urban.

Can you tell me what you've seen and what you're studying? How important is rural innovation, commercialization and research in rural Canada, including indigenous areas as you've mentioned, compared to just our urban centres?

● (1955)

Dr. John Pomeroy: It's absolutely crucial for the survival and prospering of rural regions. My focus has been water, so we look at irrigation, drinking water supplies or groundwater, but also agricultural practices that can better manage water and ways to harvest water, in unique methods.

The communities benefit substantially from this when they have a better means to their economy, when their ecosystems can remain intact. So many people in rural Canada, from indigenous to others, will have a lifestyle that involves hunting and fishing, as well as appreciation of nature. That's also critically important for these areas and it's something that gets forgotten sometimes.

We see it now with the pandemic, the exodus of people from the cities to our rural regions. We want to make sure that these are welcoming places, that these are sustainable communities that can help build the rest of this century and the country. Not everything will be occurring in the large cities.

The innovation of rural residents is something well known in Saskatchewan. I've always felt that the best graduate student in the world was a Saskatchewan farm child who knew how to fix things on the farm and could do the same in the Arctic or in a laboratory or elsewhere.

There's a wealth of capacity that comes from rural Canada that will be crucial for our science moving forward.

Mr. Ryan Williams: Thank you very much, sir.

Dr. Patry, we talk about IP. It's great to hear that, of the U15, almost 80% of research and patents come from that group.

Canada, in 2019, developed 39 billion dollars' worth of IP, but the U.S. did $6.6 trillion, so 169 times ours.

How do we begin to catch up with the U.S. on IP development?

Dr. Gilles Patry: This is one of the big challenges. One of the things we'd like to do is to analyze the patterns that are happening in business right now, and we have to admit that over the last 20 years, business expenditures in R and D, where most of the intellectual property is generated, have been decreasing at an alarming rate. While the rest of the world has been increasing their investments in R and D, in terms of business investment in R and D in Canada, that has fallen. We're now at 1.54% of GDP, which explains some of the statistics that you've just highlighted.

We've had many studies that have looked at this in the past, and I think there needs to be a bit more action in terms of the SRED credits. This is a personal view; it's not the U15 view. We do a lot of SRED credits in terms of assistance and providing credits, whereas many other countries, like Germany, do direct investments in industry and assist them through direct programs to be more competitive globally.

I know that every government has looked at that, but there's been very little movement on the SRED credit program in recent years. I'm sure my other colleagues might have some other ideas on this also, Mr. Williams.

Mr. Ryan Williams: Thank you. I know it's very complicated. I wish I had 10 minutes with you all.

Dr. Goel, we've had issues in Canada for a long time about a brain drain. A lot of graduates, including from the University of Waterloo, get picked up by the United States. How do we stop the brain drain? How do we draw more talent, and how do we have more retention of our talent in Canada?

Dr. Vivek Goel: Certainly on the science and research side, building on Dr. Patry's point, we need more investment by the private sector to hire those people. The reason those people go is they can get jobs in other countries in the disciplines they've been trained in.

In recent years, we have had shifting. Certainly in Waterloo in recent years more of the graduates are staying in Canada, but in part that's because the multinationals have figured out that they can set up here, hire the graduates and not have to pay for them to move. That is an important step because it helps to build the ecosystem. Having those jobs for people when they graduate means they'll get experience at a multinational, and then they might go to work for a Canadian firm or start their own firm, and they haven't moved to Silicon Valley or some other part of the world.

Really, the starting point is going to be that we have to create more opportunities for those Canadian graduates to stay in Canada.

● (2000)

Mr. Ryan Williams: Thank you.

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

Moving on, we'll have MP Bradford for six minutes.

Ms. Valerie Bradford (Kitchener South—Hespeler, Lib.): Thank you very much, Dr. Pomeroy, Dr. Patry and Dr. Goel, for being generous with your time this evening and offering your expert opinions from your various perspectives.

I'll direct this first question to you, Dr. Goel, because you partly alluded to it in your previous address.

Many countries, including Canada, have recently announced strategies and significant investments in emerging technologies such as artificial intelligence, quantum and genomics. What can we do to ensure that we empower institutions leading in this research so that they compete in these emerging areas?

As I said, you alluded to it before, but maybe you could expand on what else we could do. Obviously, funding is critical, but there are probably other things as well.

Dr. Vivek Goel: Yes. Critically, regarding the stability of the funding, and Dr. Pomeroy referred to this, we have different cycles of programs that lead to people having to constantly reinvent themselves. As we develop strategies such as the pan-Canadian AI strategy, the new quantum strategy, and with genomics we have Genome Canada, we need to ensure that the things we invest in have stable, continuous funding.

As I think was hinted at by the previous witnesses, we also need to look at the coordination between programs. While there are great opportunities with having separate funding sources for people, with chairs programs, the operating grants programs, the infrastructure programs through CFI, and then the research support fund, which supports the infrastructure that enables research, it can also be very challenging for researchers because they have to line up all the different funding that often has competitions at different points in time and different windows of what is eligible.

In other countries, there's program funding that enables researchers to get everything they need almost through a one-stop type of process. That's where we need to really think about how we can coordinate all these disparate funding sources in a better way and then focus them on a few of these areas where Canada has the chance to truly lead. As you mentioned, AI, quantum and nanotechnology are some of those areas.

Ms. Valerie Bradford: Thank you.

Building on that, I'd like to hear from each of you on this: What do you feel are some of the biggest challenges and opportunities in regard to working with the government's granting councils?

We can go in the same order that you presented before.

Dr. Pomeroy, would you like to start?

Dr. John Pomeroy: Thank you.

Many of the problems we face in Canada are interdisciplinary. They go further than the natural sciences and engineering, medicine, or social sciences and humanities alone, and they require an interdisciplinary or maybe a transdisciplinary approach, moving outside universities into the private sector, public sector and communities. That's very hard when we have separate agencies with separate funding streams that they wish to support.

We have a few things, such as the Canada first research excellence fund, which is interdisciplinary, but probably not enough. More of that would be very helpful.

The other thing is the long-term support that is necessary to build these research programs and to keep our capacity in Canada. Remember, when these research networks stop for a year, we lose all our post-docs, graduate students and others. Where do they go? It's probably not in Canada. That's when we leak them overseas. We need to keep that steady momentum together for these groups to keep people here in Canada, so undergraduates know what their trajectory might be in this country because of that longer term prospect.

Ms. Valerie Bradford: Dr. Patry.

Dr. Gilles Patry: So as not to repeat what Dr. Goel and Dr. Pomeroy have just indicated, one of the things I'll say is that research is a contact sport. Research is the interactions of researchers, of students and of the business sector coming together, again, with government researchers. One of the things we've been advocating is to ensure that government researchers are able to work seamlessly with researchers in our universities and also in industry. That's one way of accelerating our discovery processes.

To reiterate what was mentioned, it's very important to ensure that programs have stability. This is probably what was being referred to when we were looking at examining the coordination between agencies, to ensure that, number one, agencies work together.

I used to be the president of the Canada Foundation for Innovation, funding the research infrastructure in universities, research hospitals and colleges. I think it's time for the three granting councils, CFI and Genome Canada to work in a more coordinated fashion going forward.

● (2005)

The Vice-Chair (Mr. Corey Tochor): Thank you very much. That's the end of that section.

We're going to move to MP Blanchette-Joncas.

[*Translation*]

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

Let me welcome the witnesses who are joining us this evening.

My first question is for Mr. Patry.

Mr. Patry, first of all, I would like to thank you for your work with the Group of Canadian Research Universities. I know that you will be leaving your position next April. I would like to thank you for all your work and to congratulate you. It is a pleasure to welcome you this evening.

I have read your recommendations in your pre-budget submission for the 2022 federal budget. I was particularly struck by recommendation number 2 on Canada's investment in research and development.

As we know, Canada is losing ground and falling behind. Compared to our neighbours, the United States and other OECD and G7 countries, in terms of investment as a percentage of GDP, Canada is falling behind. This obviously reduces competitiveness.

I'm trying to see what consequences this has on the ground and in the universities. How is Canada doing in terms of not investing enough in research and development?

Dr. Gilles Patry: I would say that it is primarily companies that do not invest enough internally in research and development.

Several studies have been done on this. One of them, from the Council of Canadian Academies, simply said that companies have been innovative to the point where they should be. In short, when you have access to support programs, it's often better to take the grants that come your way than to become very competitive and invest in research and development. That was in the early 2000s and 2010s, perhaps.

What we need to do now is to give the industrial sector a new boost. In addition, as I referred to earlier, we need to review the research assistance program, the so-called SR&ED tax credits, and modify it slightly. Some have suggested that it be modified to provide ad hoc assistance to certain companies in certain sectors.

I always say that there are three important elements to activate industrial research.

First, we must invest in places where there is expertise in Canada. We must build on the expertise we have.

Secondly, we must ensure that these are large markets. We are talking about billions of dollars and hundreds of millions of dollars.

Finally, we want to ensure that these investments are profitable in Canada. If it is a manufactured product, we must ensure that it is manufactured in Canada so that it can create jobs in Canada. There is little point in developing new knowledge if it is to be exploited elsewhere, in other countries.

For me, these are three elements that have served other countries well, such as Germany and England. We have good models to follow in these countries.

I also think it is important to encourage and foster partnerships between industry and universities. My field of research is also water, as I work in wastewater treatment. As a researcher, you have to make sure that what you are developing can benefit society, and having these partnerships between industry and universities is crucial.

● (2010)

Mr. Maxime Blanchette-Joncas: Thank you for your clarification, Mr. Patry.

You also made an excellent point in the brief that the global race for scientific achievement is accelerating. Governments are increasingly taking into account the real links between research and economic growth, but also national competitiveness.

Canada is the only G7 country to have lost researchers. Why is this? Is it because the funding is not adequate enough or because it has not been supported enough in recent years?

Dr. Gilles Patry: As I said earlier in my remarks, I have done this analysis many times and I would be willing to pass it on to the committee; it is very easy to see what has happened over the last 20 years.

You know, two elements are important. On the one hand, there are the inflation costs, which are particularly important. This year, with inflation at 3.5% this year, or even 4% next year, it will be dramatic. Secondly, there is the pressure on the system. This pressure comes from inflation, but it also comes from growth. Fortunately, we have had quite a lot of growth in the area of PhD students, but not enough to be competitive.

As I said earlier, Canada ranks 28th among OECD countries in terms of the number of master's and doctoral degree holders. As a result of this growth, at about 3.5% per year, the good years for research were from 2002 to 2008—and I had the good fortune and pleasure of being a university president back then. At that time, there was funding following the launch of the Canada Foundation for Innovation, or CFI, the Canada Research Chairs, or CRC, Genome Canada, and so on. There was a lot of potential. We have regressed since then, to the point where we are now at the same level, and even lower, than in 2000.

So there are significant investments to be made in basic research, in the three granting councils, the CFI, and Genome Canada.

[*English*]

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

Now we'll move to MP Cannings.

Mr. Richard Cannings: Thanks again to all of you for being here. It's a real honour to have you. I must admit, I don't think I've seen so many Order of Canada pins before a committee in one single meeting. It's truly an honour.

I'm going to start with Dr. Patry.

Thanks for mentioning my friend Pieter Cullis and his work on lipid coating in mRNA. I really appreciate that. It shows what Canada can do.

You mentioned how important fundamental research is, but you also touched on the support for grad students who are master's and Ph.D students. Many years ago, almost 50 years ago, I received an NSERC scholarship that allowed me to go to a university and study biology, so I appreciate that. However, in talking to my colleagues now in the biology field, they point out that funding from NSERC, and perhaps the other councils, hasn't gone up in many years. Those rates have been stagnant and it's not surprising that young people are perhaps looking elsewhere.

I wonder if you would comment on that aspect. You touched on it. I would ask you to mention it again.

Dr. Gilles Patry: Absolutely. Thank you very much for the question, because it's something that we did put in our brief that Monsieur Blanchette-Joncas made reference to.

You can invest in research in two different ways. Well, you can in many ways, but one is by providing funding to the granting councils, which is obviously one of the great ways. The second way of investing is to invest directly in students through scholarships, graduate scholarships, what we call the CGS, the Canada graduate scholarships program.

You're absolutely right. The number and the value of these scholarships has been stagnant for at least 15 years. We've been advocating for a tripling of the number of graduate student scholarships. This would achieve two things. We're talking about diversity. We're talking about equity, diversity and inclusion a lot, but by investing in graduate students, we can target these graduate scholarships to students in designated groups, number one, but also in disciplines, if you want to go that far. We've certainly advocated for a significant increase in the number and the value.

I'm sure your analysts can provide you with the numbers, but when you look at the investments that are being contemplated in the U.S. right now, it is scary. I've made reference to it in my remarks. We've already seen a bit of an exodus right now. All university presidents can point to one or two individuals who have now been lured to the U.S., to Germany, to the U.K. or to Japan because of the significant investments that are made in the postpandemic era, or at least what we think or hope will be the postpandemic era.

We're at the edge of having a 1990 type of situation. We're not there yet, as I said, but we have to be a lot more aggressive. We have to support investments in graduate students and in the granting councils directly.

● (2015)

Mr. Richard Cannings: Thank you.

I would like to quickly move to Dr. Pomeroy.

Dr. Pomeroy, you made quite an interesting statement. You said that you wouldn't want to be a government scientist right now. Could you perhaps expand on that and explain why that might not be a good place to be?

Dr. John Pomeroy: Yes. The government scientists I have had the pleasure of working with have seen their budgets drop over the decades. Their numbers have dropped over the decades. Investments in federal laboratories have not continued apace. They have become isolated.

There used to be many programs for government scientist-led national research enterprises and networks and engaged deeply with them. We had funding agencies and approaches that promoted this very strongly. That seems to have declined to some degree.

Where we have sustained it and kept it strong has been with the co-location of government labs on campuses. We have the National Hydrology Research Centre of Environment Canada on the campus of the University of Saskatchewan. Working together, that builds that strength in water research that is so crucially important.

Of course, government scientists also generally cannot apply for tri-council funding, which is different from what it would be in the U.K., for instance, or elsewhere. They miss out on being investigators on large programs such as the Canada first research excellence fund, or NSERC networks, unless they find ways to bring their own cash, and often that cash is simply not there.

It makes it very challenging for them. That's difficult for students because some of our graduate students would be superb government scientists and would love to have a career as a government scientist. Those jobs are very few and far between.

Mr. Richard Cannings: You're a water scientist. Can you comment on the history of the experimental lakes area project, maybe as a cautionary tale? We heard about it in the House today, I think.

Dr. John Pomeroy: This particular facility was developed in the 1960s and 1970s. It's simply the best in the world to study the problem of acid rain, but it also then became over time a more valuable facility to study the impacts of climate change, land use development and others.

It was a federal laboratory for many years, and was dropped, as were many others. There are dozens of research basins like that across Canada, where federal research on water was conducted, that were given up by the federal government.

The universities or other groups are trying to operate them. IISD in Winnipeg is trying to keep the experimental lakes area going, but there are many others by the universities of Saskatchewan, Waterloo and McMaster—you name it. We all have our former federal research site that we're trying to keep going.

That has been part of the issue, because these outdoor laboratories, like the experimental lakes area, are invaluable for environmental research and water research. If we don't keep them going, then we lose a legacy that cannot be repeated, particularly when we have rapid climate change. We have to know how these ecosystems operated before that climate change and how they have changed during it as our early warning systems. It's quite precarious to do it now.

I'm a big fan of the Canada Foundation for Innovation. We have put many proposals together. I finished one just two hours ago to support places like this.

● (2020)

Mr. Richard Cannings: Thank you.

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

Now, moving on to our last round, it will be two questioners each with five minutes.

First up is MP Soroka.

Mr. Gerald Soroka: Thank you, Mr. Chair.

Dr. Goel, you mentioned something about research being narrow focused. I'm curious about that comment.

If someone has one fantastic idea to do research on, is the problem with the narrow focus because of the bureaucracy that's involved trying to get funding either from government or different organizations out there? Are the streams so difficult to navigate that they just continue to keep doing the same kinds of projects? Is bureaucracy really the problem with funding, as well as a lack of money and facilities?

Dr. Vivek Goel: It's really a combination of all of those things. We talked about the challenges of the granting councils. They are organized around disciplinary boundaries. Within each granting council, they have review panels which are usually organized around very specific disciplines.

I'll give you an example. I was talking today with someone about some of our quantum researchers who are developing technology that can be used for imaging brain cancers, so they're working with clinical researchers. Do they apply to NSERC, because they're engineers and physicists working on quantum technology—that's what NSERC sponsors—or do they apply to CIHR because they do clinical research? It kind of falls through the cracks.

There are these new programs like CFREF and the new frontiers in research fund, but they're very large-scale programs. If you're just that individual researcher with this great idea, you can't easily get that funded.

To build on this a little further, we talked a lot about funding, but our challenge for our researchers, and what I think you're hinting at, is that we do have a lot of complexities with our funding mechanisms. There are a lot of different kinds of forms—you can call it bureaucracy—that researchers have to fill out.

We have security considerations now that researchers working in certain areas and with certain types of partners have to work on. Universities very much support the security considerations, but the implementation is creating a new set of challenges for our researchers, with new sets of forms and hoops they have to go through that they don't see in other countries.

When we talk about the potential for the brain drain, it's going to be a combination of the funding and these bureaucratic hoops that our researchers have to go through.

Mr. Gerald Soroka: My next question is for Dr. Patry.

I was quite concerned when you talked about the brain drain. As I said to the previous presenters, I have two nephews; one is getting his Ph.D. and the other has a master's. They both went to the States and I don't see them coming back.

You said that we have fallen behind so far. Is there any way of catching up again, or is this basically beating a dead horse, because there's no way we can compete any longer with these other countries?

Dr. Gilles Patry: I think there's a way of competing, and I thank you for that question.

Maybe I should qualify this. We've fallen behind dramatically on the business expenditure in R and D. In the higher-education expenditure, we're still there, but over the last 20 years, when you look at the pressures in the system, which are inflation plus growth, the available funds, what I call the normalized funding, is decreasing.

What we're calling for is essentially a significant investment that goes beyond inflation. We have to address inflation, but we also have to address growth, and we have to address competitiveness. If we want to be competitive and ensure that research and innovation take place in Canada, and we should, then obviously we need to invest.

When we invest a dollar in a researcher, when we give Dr. Pomeroy $100,000 to conduct his research, it's not going to pay his salary as it is in the Unites States. It is going to pay for his graduate students. He takes that money and passes it on to graduate students and post-docs, so you're creating jobs essentially, and at the same time you're educating the workforce of tomorrow.

There's a perception that this money disappears in the system. Essentially, close to 80% of the funding that a researcher receives goes to support their graduate students and their post-docs.

I think there is an opportunity to be competitive because we do have areas of excellence that are extraordinary. Dr. Pomeroy mentioned water. That's also my own area, and we can point to so many developments in water technology, water treatment, waste-water treatment, water security, AI, quantum, advanced manufacturing, agriculture and so on.

There are some fantastic areas of expertise, but remember the three points that I mentioned earlier in terms of the focus. That's also an important area to look into for future development.

● (2025)

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

We are going to move to the last questions, which will be from MP Lauzon.

You're on for four minutes.

[*Translation*]

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

I am very pleased to be part of this new committee. It's a historic opportunity to sit on a science and research committee, and I'm very happy to do so.

My first question is for Dr. Pomeroy.

[*English*]

I met with the National Cattle Feeders' Association this morning, who were explaining to me the difficulty they face with drought on the Prairies. I also met with the UPA, which faced the same challenge here in Quebec with the floods.

How could your expertise, which is in the study of water, and more broadly, in climate change, allow Canada to remain competitive in cattle farming and in agriculture in general, and more precisely, in rural areas?

Dr. John Pomeroy: Thank you for the question.

One of the things I conduct research on is the water footprint for cattle, whether it's providing water for them for drinking or water for the feed for the animals, and then also making sure we dispose of waste appropriately.

With rapid climate change, what worries me about climate change more than other things are what Jim Bruce described as “the raiser”, which is water, the extremes of drought and flooding. Our farmers fluctuate between flood and drought, sometimes in the same year within the same province, but the story in the last year has been extraordinary drought. We're in a North American drought. In Canada, it extended from Vancouver Island into southern Quebec and even a bit into the Maritimes.

This week in southern Alberta there was a massive dust storm—in February. This is unprecedented. If you go back to the dirty thirties, they don't talk about winter dust storms, but this is what we're seeing now.

We have a project called Agricultural Water Futures, which is studying the water footprint of various crops. We're looking at new crops that are spreading northwards as the climate warms and what their water use and requirements are. We're also looking at how to manage soils better and how to trap snow when it's available for water supply, looking at tillage systems, and looking at mountain water supply and other water supplies for irrigation.

Both Alberta and Saskatchewan have proposed massive irrigation systems. We have to make sure there's enough water to do this and that it's available through the longest droughts, and that there is also water for ecosystems, indigenous communities, the cities, and hydroelectric and other purposes.

It's a very challenging time.

Canada's agricultural water tie-in could be even more important in the future as the rest of the world loses its ability to produce food reliably. We will have stresses and difficulties, but we will be relatively better off than many areas, including the Midwestern United States as one example.

● (2030)

Mr. Stéphane Lauzon: Thank you very much. That is a complete answer.

The Vice-Chair (Mr. Corey Tochor): Actually, MP Lauzon, unfortunately we're at the time of adjournment.

Mr. Stéphane Lauzon: Oh, my God, I have so many questions to ask.

The Vice-Chair (Mr. Corey Tochor): It went really quickly. I appreciate everyone's patience tonight.

Mr. Stéphane Lauzon: Thank you, Mr. Chair.

The Vice-Chair (Mr. Corey Tochor): On behalf of all members, I thank our presenters on the first panel and the second panel. It is a historic night, being the first time we have witnesses at this committee, and I am honoured to chair this.

It being the time of adjournment, not seeing any other business, this committee will stand adjourned until Thursday.