

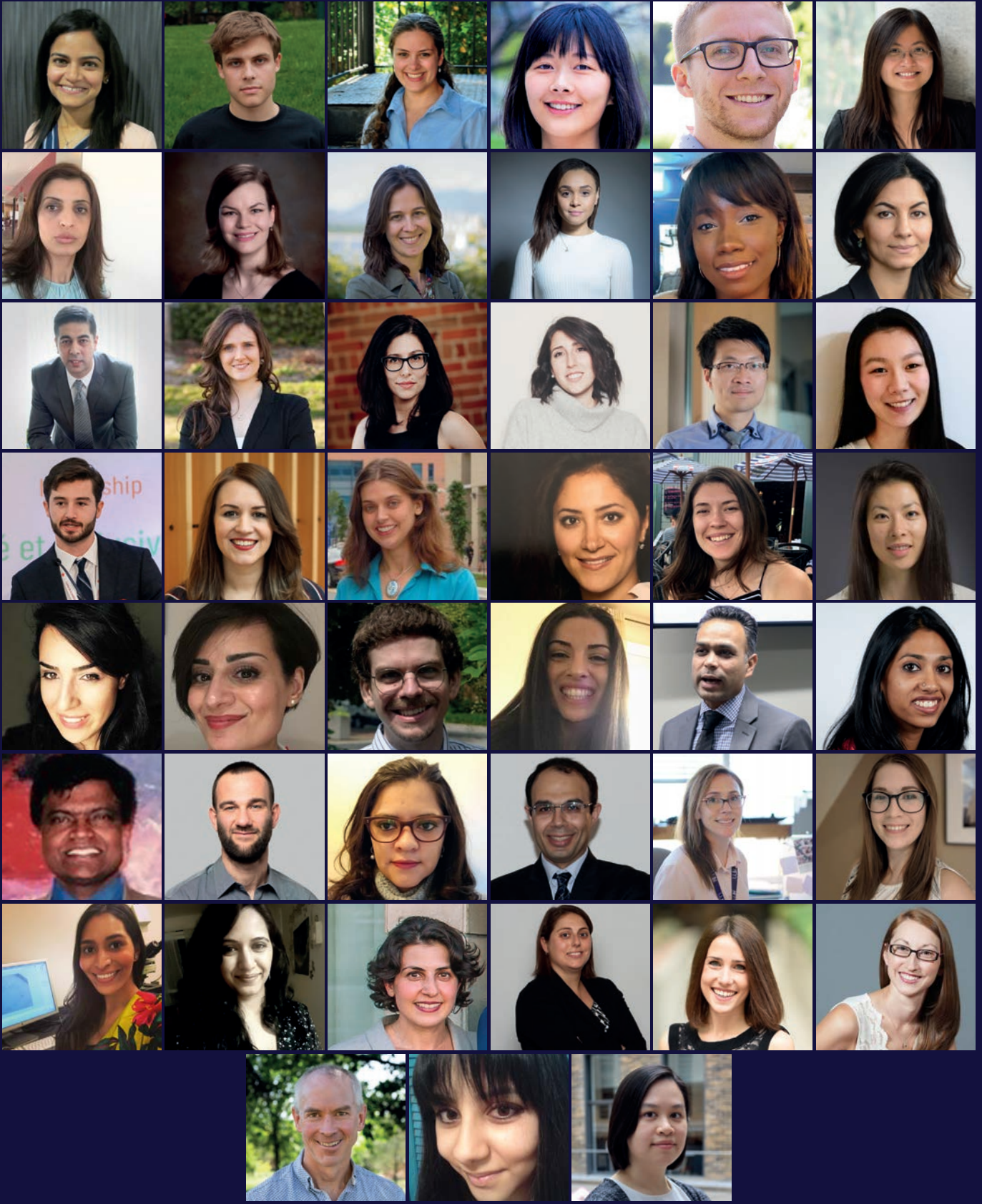


THE CANADIAN
**SCIENCE
POLICY**
MAGAZINE



**CSPC: A
DECADE
OF IMPACT**

2009-2019



MESSAGE FROM EDITORS

With a decade of experience behind the Canadian Science Policy Centre, we are delighted to welcome all of our readers to the inaugural Canadian Science Policy Magazine. We are proud to have this opportunity to showcase the thoughts of some of the greatest minds, both established and emerging, in the Canadian science policy landscape.

The CSPC is centered around the people who make up its community. The organization has been catalyzing dialogue between science and policy for a decade but it is thanks to the active participation of the thousands of scientists, policy makers, non-government organizations, private entities, and many others, that the conversations continue. Being a part of the CSPC community means a commitment to evidence-based decision making and to developing the platforms and networks that bring science and policy together to create a brighter future for everyone.

The title of the inaugural issue, CSPC: A Decade of Impact, was inspired by the influence that the CSPC has had on the policy space since its inception, but also as a means to reflect and expand our scope for decades to come. We are eager to watch as this community continues to grow and work together with the common goal of a better Canada.

CSPC Editorial Chairs

Andrew Harris, Peter Serles, Alessandra Zimmermann

We would like to take this opportunity to thank, most sincerely, all of the CSPC volunteers past and present. Many of the committees operate and make their contributions behind the scenes but they deserve no fewer accolades. The tireless efforts of our amazing team are what allow the CSPC to continue to grow and improve, year after year.

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A DECADE OF **CSPC**

Mehrdad Hariri

President & CEO, Canadian Science Policy Centre

CSPC AN AVANT-GARDE CONCEPT, DETERMINED TO REMAIN AHEAD OF ITS TIME ...

In 2008, the same year that the biggest economic meltdown of recent history happened, we started a project that seemed to have very little chances of success. We identified an urgent need for an effective interface between the scientific and policy establishments in Canada. We presented a different outlook and a new vision forward. A vision for creating a national institution to facilitate stronger interconnectivity between science and policy that would begin with a national forum on science policy in Canada as a first step, along an ambitious path forward. For its time, this endeavour was considered to be avant-garde. With no financial and organizational support, many felt that such an expansive and multi-faceted project was ambitious if not outright impossible. Within a decade, our wishful thinking proved to be practical. We delivered despite all the odds!

The idea was for the CSPC to horizontally connect existing institutions of science and innovation with policy and to promote dialogue on national and societal issues. We believed that horizontal interconnectivity was essential for a developed nation with a decentralized system of government. The complex and interlinked

With the CSPC magazine, we hope to open a new chapter in communicating the science and society connectivity, by combining the arts, human and social sciences with natural sciences and engineering, in connection with real-time societal issues and policy making, and present a **Canadian perspective on these matters.**

issues of the 21st century demanded a new and different approach. Now after a decade, the CSPC has become a national institution in Canadian science policy. Over the last ten years, the Centre has made significant contributions to a range of areas. The annual conference that has become the place to go to meet, and discuss the latest issues of science and policy, and it has earned reputation internationally. It has developed a national network and community of science and innovation policy stakeholders, serving as an effective interface for many fragmented pieces of the science policy organizations across this vast country. By building an online hub, including the community in an online forum, and raising the profile of science policy, the Centre has also managed to connect the mainstream media and the public at large with consequential policy issues that depend on scientific expertise.

Another significant contribution of the CSPC model was to the training, engagement of the youth who are the real stakeholders of Canada's future. The very first CSPC strategic plan published in 2010, featured a Fellowship program for the

first time in Canada, as its inaugural project. We are so pleased and happy that MITACS took on the Fellowships project; each year, the CSPC hosts the fellows at the conference. We continue to contribute to the training of the next generation of scientists and policymakers, as every year, 70-80 volunteers from across the country serve on various committees and participate in many CSPC projects, including this magazine. The workshop modules that will be presented in 2020, will continue to be an important component of training the next generation.

Next in line was the awards and recognition of excellence in science policy which was another first in Canada, now in its fifth year recognizing and empowering youth talent in science policy. This year, there is a new category; "Exceptional Contribution to Science Policy"; there will be more categories in the future.

Last year, we introduced another avant-garde project, the "Science Meets Parliament" project that represented yet a new frontier in our science policy

landscape. This project was only possible with the invaluable support and full partnership of the office of Canada's chief science advisor Dr. Mona Nemer. The "Science Meets Parliament" project is a novel approach to connecting science and political policymaking. It is a project that is intended not for advocacy but for scientists to learn about policymaking at the political level on the one hand, and for parliamentarians to explore the practice of evidence-based decision making on the other. This project is designed to demonstrate how science and the scientific method can be used in political policymaking.

An avant-garde project will always remain as such as long as it continues to evolve and maintain its freshness. The scientific method is by nature, antidotal to stagnation. This year, and in celebration of a decade of CSPC impact, we take on another project that has long been on our radar. In line



with its legacy as an avant-garde organization, the CSPC seeks to present a magazine in the hopes of opening a new frontier in our community.

The interrelation between science, society and policy is becoming increasingly complex and layered. We believe that a medium with a fresh perspective is needed to capture this complexity and bring together arts, science and policy making in a tangible delivery mechanism to reflect an evolving 21st-century society, a society in which science cannot be separated from policy, arts, pop culture and people in general.

With the CSPC magazine, we hope to open a new chapter in communicating the science and society connectivity, by combining the arts, human and social sciences with natural sciences and

engineering, in connection with real-time societal issues and policy making, and present a Canadian perspective on these matters.

The print version of the inaugural magazine is a gift for CSPC 2018 delegates in celebration of a decade of impact. However, the continuation of this endeavor depends solely on your support and your engagement.

We want to hear from you as to whether Canada needs a popular magazine to relate science, society, policy and arts and present them in futuristic style to reflect Canadian issues.

After all, if we don't try, we never know. Let us be together on this journey, and let us know what you think, let us dare together and be avant-garde together.



BOARD OF DIRECTORS

VISION

A strong, inclusive, and effective science policy community that contributes to the well-being of Canadians.

MISSION

The Centre is an inclusive hub for connectivity, convening, capacity building, and catalyzing research in support of an effective science policy community.



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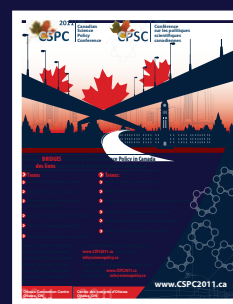
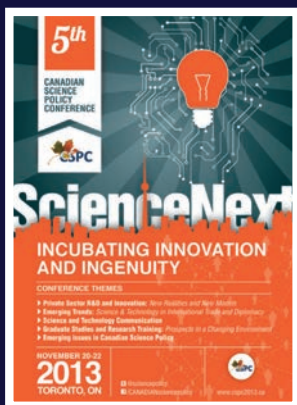
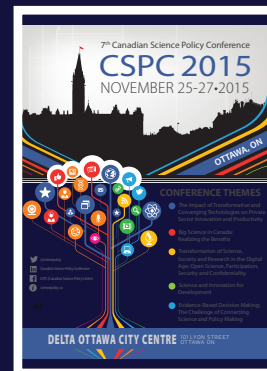
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CSPC TO CONVENE: FOSTERING A COMMUNITY

Annual Canadian Science Policy Conferences 2009-2019: A Decade of Impact

- ★ An inclusive forum for fostering dialogue on pressing issues of science and innovation policy
- ★ National focal point for connecting, exchanging ideas, and networking
- ★ Linking science and innovation to public policy and societal issues
- ★ Bringing the science and innovation discussion into mainstream media

Pioneering new insights on topical issues through symposiums and panel discussions

11th Annual Canadian Science Policy Conference 2019 Statistics

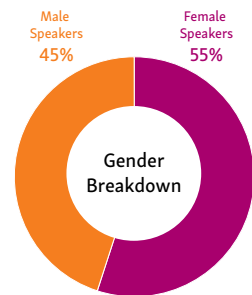
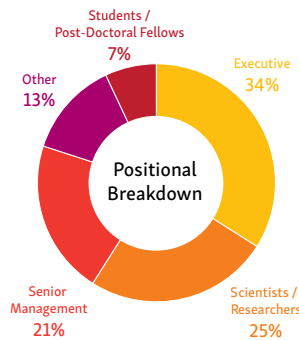
900 attendees (record-breaking numbers)

250+ speakers

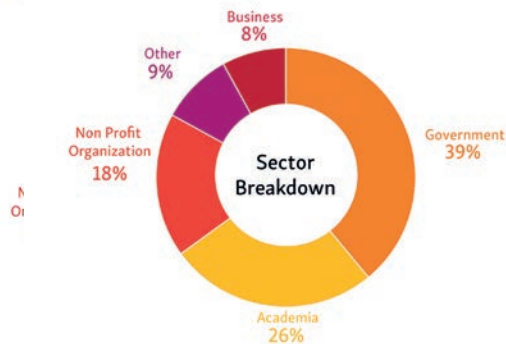
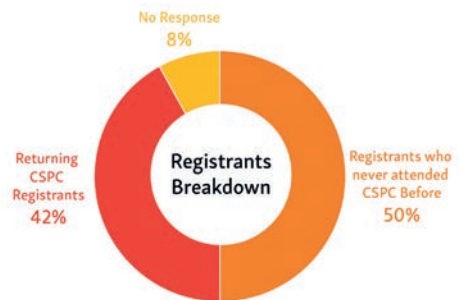
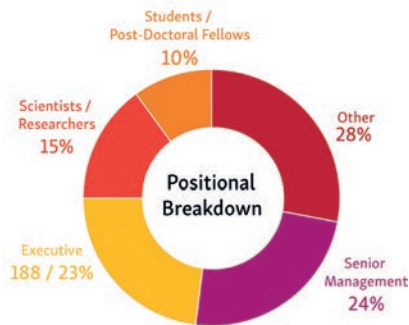
55 panels



Panelists Breakdown



Delegates Breakdown



CSPC TO CONNECT: BRIDGING SCIENCE, POLICY, AND SOCIETY

Science Meets Parliament



- ★ Connecting scientists to parliamentarians, cultivating meaningful discussions
- ★ Introducing scientists to policy making at the political level
- ★ Providing an opportunity for parliamentarians to learn about various research topics and how they may be used in policy making

Impacting National Discourse



Twitter

10.5K Followers **14.5K** of tweets



Facebook

1,300+ Followers



CSPC website/ editorial reach

28,000+ page views in Q4 2018



CSPC Newsletter

5000+ subscribers

CSPC TO BUILD CAPACITY FOR THE NEXT GENERATION

- ★ A gateway for young professionals into science policy;
1000+ volunteers engaged since 2009
- ★ Developing leadership, management, and communication skills in science policy
- ★ Workshops to train the next generation of science policy experts

CSPC IN THE HORIZON



1st CSPC Annual Magazine



6-Part Workshop Module



Science Meets Parliament 2020
Science Meets Government 2020



12th Annual Canadian Science
Policy Conference 2020

02



SCIENCE POLICY: A CHANGING LANDSCAPE



Perimeter Institute Director and
BMO Financial Group Isaac
Newton Chair

THREE WORDS TO BUILD A FUTURE ON

My congratulations to the Canadian Science Policy Centre leadership and supporters (past and present) on over a decade of connecting science and policy making for the well-being of our nation. It takes tremendous vision and drive to build research capacity and catalyze scientific discovery in Canada, and the CSPC helps provide that energy. All of us in the scientific community – from theory to experiment to application – are grateful for this.

Here at Perimeter Institute, we are nearing an anniversary of our own: in 2021 we'll mark 20 years of research operations. If I had to sum up that short history in three words – which I've had to do a surprising number of times since becoming Director in February – they'd be these: Simplicity. Clarity. Audacity.

I first heard about Perimeter in the fall of 2000, when I met founding donor, Mike Lazaridis. At the time, Mike was in the middle of creating the world's first full-fledged smartphone. He saw it as a triumph of theoretical physics, depending as it did on Maxwell's electromagnetism from 150 years ago, and Einstein's relativity from 100 years ago, and a whole lot of quantum mechanics from the last 80 years.

I think Mike knew his device was about to reshape the world. But he didn't want to talk about that – he wanted to discuss where the next breakthroughs would come from. The ones that would shape the lives of our children and grandchildren and great-great-grandchildren. And he had an answer, too. They'd come from right here, in Waterloo, Ontario, Canada.

Mike proposed that we found a new institute dedicated to making those breakthroughs, tackling the most difficult problems in physics. This institute would be independent and highly focused and would bring together many of the world's best minds. It would be collaborative with the national community, helping advance the basic research that underpins science and technology.

I was struck by the simplicity, the clarity, the audacity of his vision. Those are the hallmarks of a powerful idea. As a scientist, I know how precious ideas like that really are.

Soon after, I left my position at McGill and joined Perimeter as one of its founding faculty members.

Nineteen years later, the power of Perimeter's founding vision – its simplicity, clarity, and audacity – continues to inform every aspect of what we do. It motivates us, and it draws in public and private partners who understand the role of theoretical physics for the province and country.

At Perimeter, we don't have any equipment more complicated than blackboards and computers. We like to say we run mostly on chalk and caffeine.

Yet Perimeter researchers have developed theories, tools, and analysis behind many headline discoveries over the past decade. Activity this calendar year is dazzling. In January, Perimeter scientist Kendrick Smith (who holds the Daniel Family P. James E. Peebles Chair) played a crucial role in the detection of fast radio bursts at Canada's CHIME telescope.

In April, our researchers helped capture humanity's first glimpse of a black hole. Avery Broderick (who holds the Delaney Family John Archibald Wheeler Chair) and his team did much of the critical theoretical work behind that famous image.

What will the next twenty years bring? In astrophysics, torrents of data are pouring in from cutting-edge instruments. When combined with new computational approaches, solving longstanding challenges such as the nature of dark matter and dark energy may be within reach. There are clearly breakthroughs coming in quantum technology – ultra-precise sensors, new materials, new computers, and much more. Researchers at Perimeter are helping to lay the theoretical foundation on which these technologies will be built. Computational physics combined with AI provides new doors to progress, and Perimeter’s new Quantum Intelligence Lab is working to open them. Indeed, an entire research and innovation ecosystem called Quantum Valley has arisen in Waterloo between Perimeter Institute, the University of Waterloo, and quantum commercialization ventures. But when I really want to imagine the future, I think back to Mike’s original vision for Perimeter.

Maxwell, Einstein, the quantum pioneers: were those physicists working toward a smartphone? Of course not – they couldn’t even imagine it. Most of Perimeter’s work is focused on

questions like: How did the universe begin? What’s it made of? How does it work on the most fundamental level? These are the big questions. The simple questions. The audacious questions. Ultimately, they are also the most useful questions. The ideas, theorems, and breakthroughs that are being born today will result in a new generation of wonders that our grandkids will hold in their hands.

In that spirit of scientific optimism, the Perimeter family salutes the drive and positivity that the CSPC brings to making our nation – and our world – a better place through science. Here’s to

our shared vision, our shared history, and our shared future.

**These are the
big questions.
The simple
questions.**

**The audacious
questions.
Ultimately, they
are also THE
MOST USEFUL
QUESTIONS.**

SCIENCE IN A CHANGING POLITICAL ENVIRONMENT

Preston
Manning

Founder, Manning Foundation
for Democratic Education

On previous occasions, as a federal parliamentarian with a personal interest in science, I have commented on and lamented the “gap” between the political and science communities in Canada.

It has been a gap perpetuated by a lack of interest, politicians uninterested in science and scientists uninterested in politics; a lack of scientific knowledge on the part of politicians and a lack of political knowledge on the part of scientists; a lack of strong personal relationships between scientists and politicians; and significant differences in communications styles – politicians tending to be “receiver oriented” communicators and scientists tending to be “source oriented”.

Measures proposed and sometimes adopted for closing this gap have included recruiting more science oriented candidates to run for public office and to serve as political staff; attaching science advisors to ministerial offices and creating a Parliamentary Office of Science and Technology to advise legislators; deliberate, personal, relationship building efforts by both politicians and scientists; and harnessing the science of communications to the communication of science.

All of these activities to close the gap between the political and scientific communities are worth continuing and expanding. But as the political landscape changes and the relationship between the political and scientific communities becomes more intimate, there are certain dangers and pitfalls to be avoided, particularly from the standpoint of the scientific community.

On the ethical front, the political class is becoming more relativistic (there are no absolute standards, just different opinions), pragmatic (“go with the flow” and whatever works is “right”), and utilitarian (if anticipated benefits outweigh estimated costs, proceed). But should

not science insist upon and demonstrate higher and more rigorous ethical standards than these?

Scientific conclusions are the product of a well defined intellectual process and, in public policy making, should not be regarded as simply another “opinion”. The case for basic science rests, not solely on utilitarian considerations, but on a deontological foundation – that certain pursuits are inherently worthwhile regardless of whether or not the potential benefits outweigh the immediate costs. And science for its own sake needs to acknowledge and guard against its “dark side” – the misuse of science for destructive purposes – a subject which most politicians prefer to avoid.

And on the partisan political front, as politics becomes more polarized and political communications come to be dominated by the social media, science needs to guard against its personnel and its findings becoming little more than “weapons” in partisan political warfare. The political champions of policies to address climate change, for example, have in many cases co-opted the scientific basis for defining and addressing this issue and have become its chief spokespersons. Many of those who oppose the political champions of climate change have then reacted by denying the science, although as Stephen Pinker points out in his recent book, *Enlightenment Now*, the principal reason these people deny the science is not so much due to an anti-science bias as to an unwillingness to be identified with its self-appointed political champions.

Neither of these developments - the co-opting of scientific conclusions for partisan political purposes nor the reactionary denial of the related science because of its identification with such co-optors – are in the interests of science or conducive to achieving a positive, long term relationship between the scientific and political communities. So what can the scientific community do to avoid the real or potential pitfalls of a closer association with the political community under these circumstances? The most important thing is for scientists to vastly increase the frequency, magnitude, and effectiveness of their own direct communications with the public, rather than allowing the communication of science to be proactively or reactively co-opted by politicians for purely partisan purposes.





HOW THE HARPER REGIME CHANGED THE **CANADIAN** SCIENCE POLICY LANDSCAPE

Known both at home and abroad for muzzling its own scientists, the Harper government does not exactly come to mind as a progressive player in science policy.

But for the Conservative regime of 2006-2015, Canada's science communities would not have come out of their somnolent state and awoken to the threats facing the use of evidence, and sound science in public policy.

It started with the usual response and rhetoric. A minister of state for science and technology was appointed. The government's 2007 science, technology and innovation strategy and later update of 2014, provided guideposts for priorities that the Harper regime would support. The Science, Technology and Innovation Council (STIC), with largely confidential advice, was launched in 2007 after the elimination of three other public, science advisory bodies. Today, STIC is now just another failed experiment, and a new Council on Science and Innovation has been mooted by the Trudeau administration. The Harper regime was not truly anti-science as some have argued, though its proclivity for antediluvian views affected its approach to climate change, among other issues. The Harper budgets did provide support for R&D, with an emphasis on 'science powering commerce'. And yet, in the 2007 federal STI strategy, the opening section argued that: to achieve world excellence in science and technology,

P
aul
Dufour
Senior Fellow, Institute for
Science, Society and Policy, UOttawa

Canadians must promote two complementary and indivisible freedoms: the freedom of scientists to investigate and the freedom of entrepreneurs to innovate and market their products to the world. Ultimately, it was the clamping down on this freedom for scientists to investigate, bring forward evidence and communicate their knowledge that led to an awakened research network advocating for openness and transparency-- one that became politically more effective and media savvy.

With the muzzling of its own research employees and cuts to federal government science, the Harper administration garnered the most attention, triggered in part by the elimination of the National Science Advisor position in 2007. It is easy to forget that the Conservative Party election platform for 2005 had actually promised an independent Chief Scientist, but clearly this never made it past the polls.

Broad elements of the science community, led by new advocacy groups, took on the Harperites. Democracy Watch and UVictoria's Environmental Law Clinic submitted a report to Canada's Information Commissioner detailing a series of examples of Harper government officials blocking media access to scientists.

And while that review took five years to be confirmed, other groups led the way, including the Professional Institute for the Public Service, a newly-formed, dynamic Evidence for Democracy, and the two Canadian science writers' association, all chronicling the abuse of the fundamental tenets of science. It is worth noting that a particular proposed cut to the Experimental Lakes Area experiment resulted in pressure from scientists, (including a graduate student from UAlberta leading the way) both at home and abroad to reverse the decision.

Other organizations formed in the Harper period, including the Canadian Science Policy Conferences and the creation of a student-led Science and Policy Exchange in Montreal. Both provided needed fora for lively debate and discussion. The Death of Evidence march of over 2000 scientists on Parliament Hill in July 2012 was another landmark event, one which placed the gravity of the muzzling situation on the global map-- and gave impetus to a renewed advocacy from a youth movement challenging the status quo. In the waning years of the Harper administration, it became clear the the public was on the side of reversing the poor treatment of

researchers, public research and the institutions that housed them. Going into the 2015 election campaign, one political party jumped on this trend and began calling for greater support in the use of evidence in decision-making and valuing the importance of science and scientists.

This became a key touchstone of the Trudeau administration, and in an unprecedented move, it was imbedded in every public mandate letter given to Cabinet Ministers (though today, no scorecard has been provided on whether the mandate letters were fulfilled in this area). Almost ten years after the National Science Advisor position had been eliminated, the new Minister of Science appointed a Chief Science Advisor to be more in tune with the growing number of such positions around the globe. More specifically, the CSA's job was to ensure that government science is fully available to the public, that scientists are able to speak freely about their work, and that scientific analyses are considered when the government makes decisions.

There was an even more far-reaching change in the landscape; fundamental research had suffered at the hands of the previous regime preoccupied as it was with science powering business. The new Science Minister established a blue-ribbon expert panel in June 2016 led by David Naylor to assess the state of fundamental science. The review involved a broad online consultation as well as targeted roundtables across the country. The final report tabled in April 2017 made a series of recommendations targeting science advice, support for research infrastructure, funding for early career researchers, and several other key initiatives. Among the specifics was a recommendation to create a new advisory body for science and technology.

And the 2018 federal budget followed up with large investments in discovery research in partial response to the Naylor report. As we approach 2020, it is helpful to recall that the Harper regime triggered a 'cri d'alarm' both within the knowledge community and the informed public which led to some significant changes in the science policy ecosystem. Proactive stances replaced reactive responses. It was no longer science for the lambs. Hopefully, the positives will now outweigh the negatives in this new era for Canadian science. But continued vigilance and advocacy will be required from a larger, informed public.

THOUGHTS ON THE EVOLUTION OF SCIENCE POLICY OVER THE LAST DECADE

Janet
Halliwell
Principal, JE Halliwell
Associates Inc

Mehrdad
Hariri
President & CEO, Canadian
Science Policy Centre

“Science and technology policy consists of two major strands: policy for science and technology – namely, the policies related to strengthening the research and development enterprise in the public and private sectors, to science and technology education and training, and to fostering the conditions under which advances in science and technology are translated into economic, security, and environmental benefits for society at large; and science and technology for policy – meaning the use of insights from science and engineering in the formation of those part of economic policy, defense policy, space policy, health policy, environmental policy, agricultural policy, and so on, where such insights are needed to help shape sensible policies.” How to summarize the remarkable transitions in Canada in regard to both strands of science policy over the last decade? Let us take on this challenge with a few key observations:

Policy for science

Aggressive pursuit of excellence – while a continuing policy for Canada, the last decade has brought intense focus to attracting and retaining world class researchers through such vehicles as the Canada Excellence Research Chairs and the Canada First Research Excellence Fund that concentrate major investments in a limited number of researchers/initiatives.

The increased focus on “wicked problems” has been influenced

by such global actions as the UNDP Sustainable Development Goals (SDGs) and the IPCC work on global change. The culture, organization, management and funding of S&T is morphing as a result. We are seeing policy changes designed to foster more inter, multi and transdisciplinary research, international collaborations, and explicit inclusion of the social and human dimensions.

There have been shifts in federal policies for research that parallel the EU pillars of “responsible research and innovation” - six pillars of action targeting gender equality, science literacy and science education, public engagement, ethics, open access and governance, each of which has moved closer to centre stage in Canadian policies for science within and external to government. This is manifest in increased federal actions focusing on EDI and supporting open science, including the free flow of information (open access and unmuzzling government researchers), ethics and reproducibility in science, citizen science, and attention to public awareness of the results of publicly funded research.

The continuing concern with linking academic research and business has led to evolution of how this is done, with more focus on industry “pull” through such initiatives as the major Clusters, shifting of some of the NSERC business-oriented programs to ISED, and phase-out of the NCEs.

Science for policy

As for science for policy, we have witnessed significant changes over the course of past decade.

Numerous new institutions have emerged. From grass roots and not-for-profit organizations, such as CSPC, to many others that have been created by universities or by the governments. Among them, the establishment of a federal Chief Science Advisor was a milestone. Similarly, the expansion of the network of science advisors within various federal departments is significantly strengthening the infrastructure of science for policy.

The discourse of science policy has also been much affected. The notion of evidence-informed decision making is much more widely accepted, not just within the bureaucracy but also in political decision making as well as with the public. This does not mean that evidence has been absent from decision making tables in the past. But having this as recognized priority at all levels, including the highest levels of decision making in Canada is a significant shift. It is also notable that the role of evidence in decision making is an issue increasingly addressed by the media.

With this being said, the translation of science into policy is facing significant headwinds.

On the one hand, the pace of scientific and technological discovery is accelerating; new generations of technologies such as artificial intelligence and commercial utilization of space are emerging and being implemented rapidly.

It is not an exaggeration to refer to our time as the era of disruption and transformation. But policies for their governance are not keeping pace. Inevitably the policy process is slow by nature, in particular in democratic nations but must be able to adopt to new realities of the time.

And there is another challenge for science policy in this era of a “knowledge society” that seems singularly bedeviled by distrust of science and, in some quarters, popular disdain for evidence as an input to decision making. Never has knowledge been so important – witness the evidence for climate change, the impact of genomics on health care, the IoT, and progress on alternative energy sources. But perhaps never has the stature of science and scientists been so vulnerable. The democratization of science (e.g. through the Open Science and citizen science movements) is a small step in the right direction, but we need deeper reflection on what changes we need in the institutions of science production and utilization. But what are the institutions in Canada that can lead this charge?

Addressing this challenge is not an easy, and requires significant attention from policy practitioners, scientists, in addition to the media and the public at large.

In Canada, and over the past decade, the landscape has changed in the right direction. More work is required. Building new institutions and capacities are absolutely necessary. But perhaps, the highest priority is to build capacity for a new generation of experts who can bridge the worlds of science, policy and public engagement.



Katie

Gibbs

Executive Director, Evidence for Democracy

A DECADE OF SCIENCE ADVOCACY IN CANADA

Looking back on a decade of science advocacy, it's hard to believe how far we've come. A decade ago, 'science advocacy' was barely a thing. There was no infrastructure, no organizations working to support it, no coordinated movement in the scientific community. Now, ten years later, Canada has a thriving science advocacy community full of individuals and organizations passionate about advocating for science policy and pushing to make sure science is used in decisions. Perhaps the most important lesson from the past decade is that science advocacy works. If you look at the federal science policy landscape today compared to a decade ago, the difference is stark.

A decade ago, the government had just eliminated the National Science Advisor position, today we have a new and thriving office of the Chief Science Advisor. A decade ago, fundamental research was taking a hit with tri-council funds being reallocated to industry driven research, today tri-councils have seen huge boosts for fundamental research. A decade ago, government scientists were complaining of 'muzzling', today many federal departments have put in place Science Integrity Policies, ensuring that federal scientists can speak publicly about their work.

This progress didn't happen by chance. It was achieved because over the past decade the research community has come together in unprecedented ways to stand up for science. What started as loose and informal groups of scientists speaking out a decade ago, has grown into a new and thriving field. While the field may still be young we have learned some important lessons along the way.

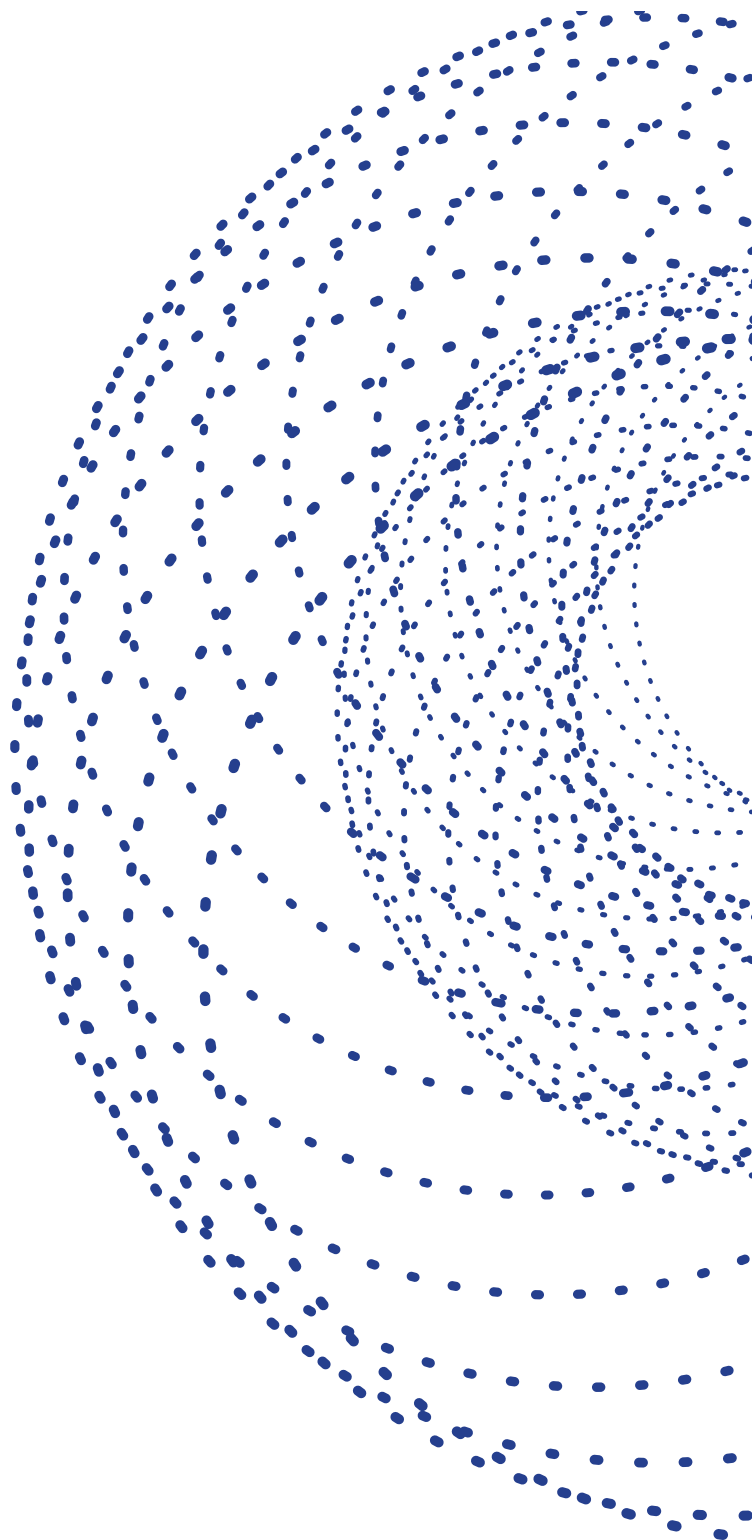
We've learned that scientists need training and support. Science advocacy often intersects with science communication and science policy but all of these areas are still things that many science students have not been taught as part of their regular science education, and often aren't encouraged or incentivized to do. While the interest in science advocacy is growing, scientists need access to training to ensure they are doing it well and having the most impact possible. We've learned that different governments require different strategies. Science advocacy in Canada very much got started out of protesting government actions, but with a change in government in 2015, it required a change in tactics too. Along with learning how to work with

a government, not just protest it, we learned that advocacy is just as necessary with a government that is open to change on these issues. We've learned that we're stronger together.

One of the most successful science advocacy highlights over the past decade was the way in which the science community pulled together to push for the federal government to implement the recommendations from the Fundamental Science Review report. For the first time, many groups including non-profits, student groups, university associations and science societies all came together to coordinate their actions and responses. And the result was a success, with the government using the report as a clear roadmap for new investments in science.

We also learned that many of the fears people had early on didn't come to pass. When science advocacy in Canada was in its infancy, many people wanted to engage but were worried about possible repercussions for their careers. This was especially true for students and early career researchers. But now, a decade on, many of those most active and vocal have gone on to have successful careers in academia, the nonprofit sector, and even in government.

The past decade has been one of progress. We've worked together in exciting and unprecedented ways and seen real progress as a result. But the progress we've made here in Canada isn't in a vacuum, it's happened during a period of worrying global trends including declining trust in science and a public and politicians that are increasingly labeling scientists and experts as 'elites'. While we should take immense pride in the progress we've made here in Canada, we aren't immune to these forces. Instead of letting our progress make us complacent, we need to take what we've learned over the past decade and double down on advocating for science for the decade to come.



EVIDENCE
INFORMED DECISION MAKING

AUDACE, ENGAGEMENT AND DIALOGUE TO CONDUCT AND COMMUNICATE RESEARCH IN NEW WAYS

Rémi
Quirion

Chief Scientist of Québec

Scientific publications have long been the benchmark for measuring the performance of the scientific community here and around the world. The three Québec Research Funds, which I lead as Québec's chief scientist, have supported research excellence and training for several decades. They promote the excellence of research that is closely associated with scientific publications. Knowing that excellence thrives on creativity, the Funds seek to recognize the researchers who forge new paths in research and its dissemination. It is essential to allow our researchers to explore new ways of doing things to stimulate innovation and strengthen links with our fellow citizens!

Indeed, the Funds intend to spark risk-taking in research and encourage researchers to be bold! They also want to foster the commitment of the scientific community and civil society to joint projects and promote dialogue between science and society to make scientific knowledge a leading source of information for governments at all levels, businesses, organizations and citizens.

In response to this will for change, the Funds created three programs—Audace, Engagement and Dialogue—to conduct and communicate research in new ways. The first, Audace, was launched in 2017. Engagement and Dialogue were recently announced.

Audace aims to support high-risk, high-reward research projects that break with established frameworks and ways of thinking: initiatives that build on uncommon collaborations between, for example, historians and mathematicians or neuroscientists and physicists or even farm operators and painters. In sum, Audace provides the scientific community with the opportunity to undertake the most unconventional projects!

Among the 37 initiatives that have received Audace funding are the production of ethical foie gras based on biomarkers and ecological considerations in response to societal demands with regard to animal welfare and agriculture, an approach to treat bacterial infections without killing the bacteria or causing resistance to end the competition between increasingly powerful antibiotics and ever more resistant bacteria, and the 3D printing of innovative biomaterials using under-developed forest resources. Needless to say, there is no shortage of potential for discovery or innovation!

The Engagement program supports citizen involvement in research approaches, enabling individuals recognized for their experiential knowledge who are pursuing a career outside scientific research to play an active role in a research project. Anyone with a brilliant idea could even co-direct the project with members of the research team, in keeping with the quality and ethical standards set out by the Funds. This type of engagement serves to demystify the research process and stimulate citizen interest in science. Similar programs have already been implemented in North America and Europe, and Engagement proposes to push the boundaries of citizen participation in science.

Finally, Dialogue gives members of the scientific community the opportunity to interact with the public and discuss their efforts, findings and approaches to spur interest and a broader understanding of science. Through the Dialogue program, the Funds will recognize and support researchers and research students who want to share knowledge in the public space, media and social networks, since we must heighten the participation of researchers in the health sciences, natural sciences and engineering and social sciences and humanities to ensure our fellow citizens develop critical thinking and young people take an interest in science. There is no doubt that the Dialogue communication projects will dismantle the myth that scientists refuse to come down from their ivory towers!

Through the triad of the Audace, Engagement and Dialogue programs, the Funds are paving leading-edge ways in scientific research and communication for the greater good of all Quebecers. It will be important for science policies in the future to be even more open to new ways of doing things and to further promote bold research, citizen engagement in research, and dialogue between researchers and civil society.

SCIENTIFIC GUIDANCE ON THE ENVIRONMENT HAS UTTERLY TRANSFORMED CAN POLICY KEEP UP?

Kai
M. A. Chan

Professor, Institute for Resources, Environment, and
Sustainability, University of British Columbia

The bar for science policy just got a whole lot higher—all across the world. It's not clear that Canadian policymaking is up to the task.

The relevance of science for policy used to be quite contained. Science helped set the limits for arsenic in drinking water, for particulate matter of various sizes in indoor and outdoor air, and for population sizes and trends in determining whether species were vulnerable, threatened, or endangered.

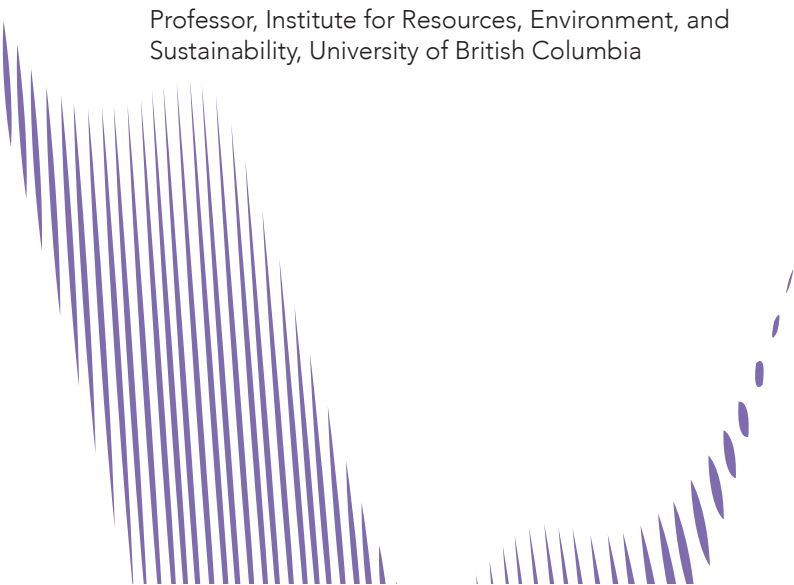
Over the past few years—and particularly this year—the domain of science policy has exploded to include systemic governance issues that were previously the sole domain of economics and politics. How should governments encourage industrial production? How should we make management decisions about resources (not just which decisions, but how precautionary, adaptive, inclusive, and integrative across sectors and jurisdictions)? Also, how should we regulate which chemicals can be used in consumer goods, and even how we should limit the material and energy we collectively consume?

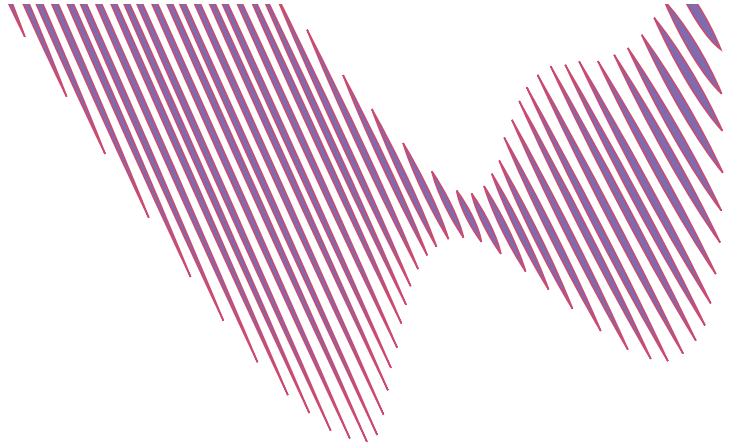
How did this happen? It happened thanks to two major but underappreciated advances, in science-policy processes and in science.

The science-policy landscape always included studies offering implicit guidance on such topics, but until now that guidance was never both explicit and officially sanctioned by 132 of the world's nations. The innovation here comes in the form of UN bodies such as the Intergovernmental Panel on Climate Change (IPCC) and the newer Intergovernmental Science-Policy Platform on Biodiversity and Ecosystem Services (IPBES).

Whereas in the past, individual articles had implications for large-scale systemic decisions, they never had force for several reasons. Many were too limited in scope, in at least one dimension. Either they were local scale or they were global but without distinction between national contexts. Many addressed just one challenge—e.g., climate change—without consideration of side-effects of actions on others. Many were not explicit enough about what might need to change, while others were too explicit, reaching beyond the evidence. And for every study with one conclusion, other studies—equally reputable for most policymakers—seemed to contradict it.

No longer: now assessments of IPCC and IPBES cover a global





scope with regional differentiation; they review all the relevant evidence while distinguishing the robustness of different studies; and they are explicit about policy options towards already-accepted global and national goals. Most important, these assessments are not merely science—their central findings are thoroughly reviewed, edited and approved in several steps by member nations. Thus, not only are the studies relevant, pointed, and authoritative, they get officially endorsed by the nations themselves.

The second key advance is in the integrative nature of some of the science. A central reality of policymaking is tradeoffs, such that a solution to one challenge is no solution at all if it exacerbates another challenge. Not only have individual studies become more integrative across multiple considerations—e.g., climate, energy, and land-based food production—but assessment processes have become more integrative yet.

As one example that I know well, thanks to the pleasure of leading this effort with more than thirty world-leading scientists, is Chapter 5 of the IPBES Global Assessment, “Pathways towards a Sustainable Future” (Chan et al. 2019). This integration included a comprehensive and systematic evaluation of future scenarios and pathway analyses that addressed the challenge of mitigating climate change while providing sufficient energy for humanity and maintaining space for agriculture and life on land. Beyond that, it meant the same assessments of scenarios and pathways for five other foci of difficult tradeoffs: feeding humanity without undermining biodiversity; protecting and restoring nature in an inclusive way that respects human rights and contributes to human well-being; securing seafood for the future while protecting nature in oceans and coasts; maintaining freshwater for human uses and aquatic biodiversity; and resourcing our growing cities while maintaining the nature that underpins them. These six focal points correspond to several UN Sustainable Development Goals and Aichi Targets for Biodiversity, which nations have agreed and committed to through the General Assembly and the Convention on Biological Diversity.

The biggest challenge is that tradeoffs also reach across these six foci, just as intensive agriculture might produce masses of food and leave space for forests and wetlands, but it risks unacceptably tainting freshwater supplies for both people and

aquatic life. Accordingly, our international team had to evaluate whether solutions exist to simultaneously achieve global goals across all six foci, and what the broader literature has to say about those solutions. Never before has a single analysis straddled such an expansive problem at the scales relevant to national commitments.

The answers pinpointed changes that were more systemic than ever, getting to the heart of what it means to govern a nation, state, or municipality. Solutions that addressed all six foci tended to employ five different ‘levers’ of governance interventions, and they tended to do so at eight different ‘leverage points’ in social systems. For instance, virtually all pathways involved a substantial reform of subsidies and incentives away from boosting production at the expense of the environment, toward improving environmental stewardship (a lever). And they applied these levers at ‘leverage points’ like prevailing notions and narratives of a good life, recognizing that the inadvertent adoption and promotion of largely western notions of success that entail high levels of material consumption are neither conducive to human well-being nor to achieving collective goals for nature.

Is Canadian science-policy up to the task of contributing to sustainable pathways for the planet? It remains to be seen, but what is becoming clear is that the science is there to assist in that task—and to evaluate progress toward it.

Is Canadian science-policy up to the task of contributing to sustainable pathways for the planet? It remains to be seen, but what is becoming clear is that the science is there to assist in that task—and to evaluate progress toward it.

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CROSSING THE BRIDGE FROM SCIENCE TO SCIENCE POLICY

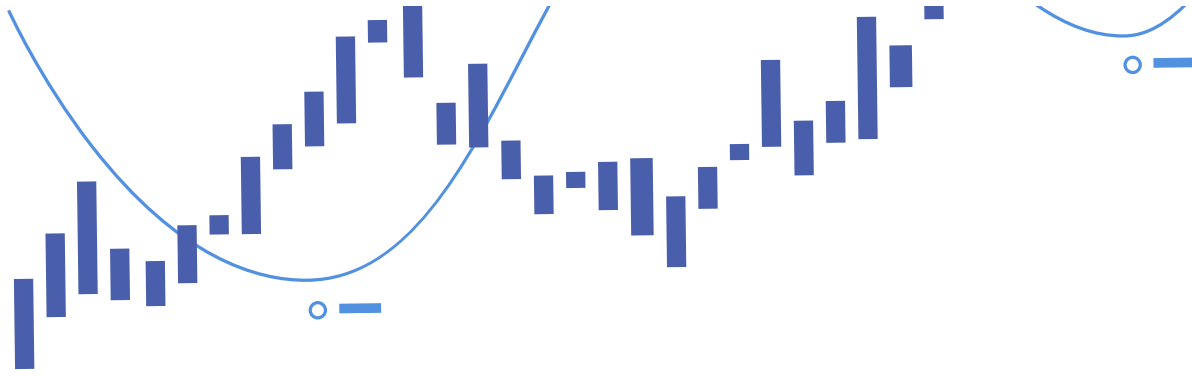
S hawn Marshall

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Is Canada entering a golden age for science policy? Many of the barriers that exist between the worlds of scientific research and government policy are becoming more permeable. Political developments such as the appointment of a Minister of Science, a Chief Science Advisor for Canada, and the network of Departmental Science Advisors are large steps forward, as are commitments to open government and open science.

A Science Integrity Policy crafted by the office of the Chief Science Advisor has now been adopted in most science-based government departments, with open data and open science policies in the works. Among other things, this ensures that publicly-funded science should be available to the public, and should not be censored or twisted to reflect political whim. However powerful our leaders may feel, they cannot change the path of a hurricane. Meanwhile, research funding in Canada is at record levels, and with it a growing awareness at the granting councils of the need to support a more diverse range of scholarly contributions and audiences. Programs like the MITACS science policy fellowships and the explosion in profile of the Canadian Science Policy Conference offer clear avenues for scientists to gain policy experience and exposure.

While these developments are exciting, it is still not as simple as it sounds to bridge from scientific research to policy. As a long-time research scientist that has recently entered the mysterious realm of science policy, I can testify to some of the challenges in navigating between these worlds. For many scientists, there is limited internal or external motivation to dip their toes into the policy fray. The creativity and deep thought that are central to the research enterprise are extremely rewarding and consuming, and time spent in the public arena cuts into researchers' core scientific activities. It can also be



daunting to venture from the safe haven of the research lab, and the academic system still does not strongly support such forays. Success with research grants, promotion, and tenure remains deeply rooted in scholarly publications and citations, while public outreach and policy contributions are not generally recognized. This is slowly changing at the funding agencies, with increased emphasis on 'impact' (quality vs. quantity), but it is not simple to measure scientific influence. There is no convenient citation index for the uptake of ideas from informal conversations or briefing notes.

On the opposite shore, the policy world can be disorienting. Human and political systems do not adhere to deterministic behaviour or conservation laws like those in physics, making the policy world both rich and complex. Scientists are the minority in the science policy realm, outnumbered by economists and political scientists, and this creates an unfamiliar culture. A different skill set is required to be effective in this milieu, more rooted in social intelligence. Interpersonal dexterity is critical, and it can sometimes seem that eloquence wins out over evidence in policy decisions. Scientists need to learn to cultivate relationships and the importance of trust, patience, and humility, along with respect for the fact that policy decisions are not just about the science. At the same time, decision-makers need to be open and respectful to scientific evidence, to better harness it in support of effective long-term policy.

Despite some cultural differences, researchers, policy analysts, and decision-makers have a great deal in common. Circumspection, balance, depth of thought, and analytical skills are all valued talents at the science-policy interface, and cross over well from the research world. Everyone shares the common objective of contributing to the betterment of society. Scientists may feel affronted that policy leaders are not interested in the scientific details, but researchers have the luxury of studying and understanding a system in great depth, while political leaders and their councillors must embrace a wide breadth of issues. This is where the role of science to inform policy is particularly

critical. We live in a time when there is so much instant information at our fingertips, reliable or not, but information is not knowledge.

The latter implies understanding. Policy without understanding is a frightening proposition, and the world needs better than that right now. A huge swath of societal challenges requires scientific input, from artificial intelligence to health, environmental, and climate policies. When brought to the table properly, science is coldly rational and democratic, independent of biases, public opinion, or political predispositions.

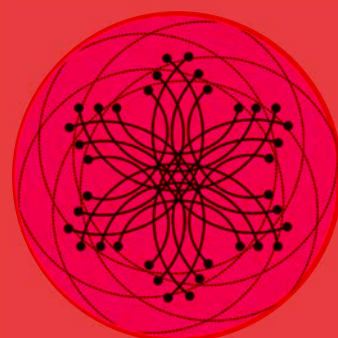
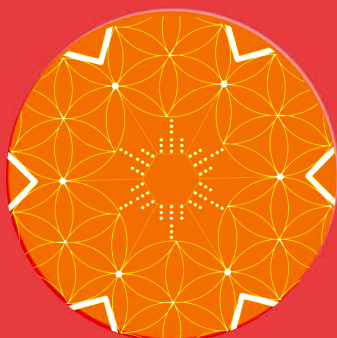
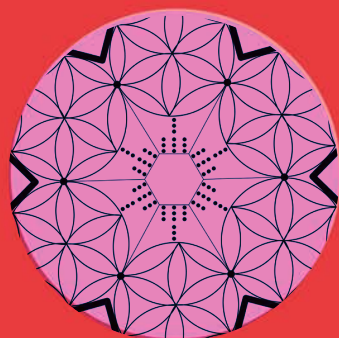
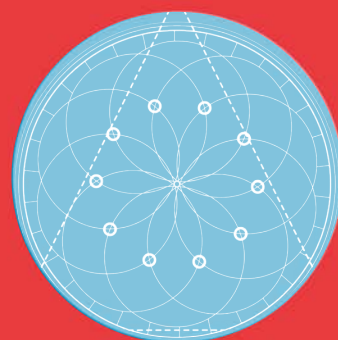
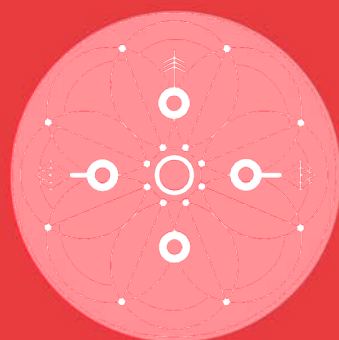
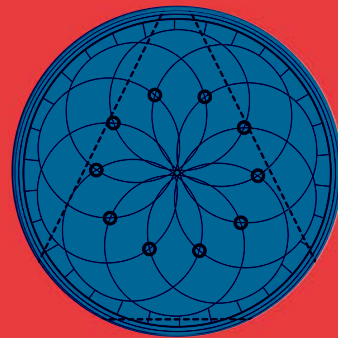
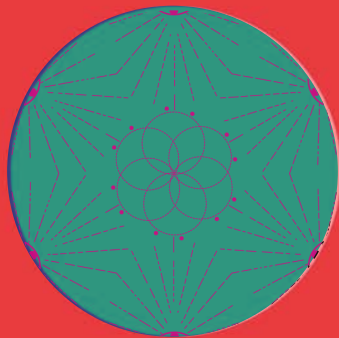
Communicated effectively, science can support leaders with some of the difficult, unpopular choices that are nevertheless in the interest of society. Policy development is more of a compromise than scientists care to admit, involving economic, social, and political calculus. It would be wonderful for all of Canada to be a national park, for instance, in support of biodiversity and environmental health, but we cannot have a sustainable country without agriculture, urban development, and industry. We have a Canada Food Guide and solid understanding of nutrition, but it would seem like political over-reach to legislate healthy eating habits. That said, there are times when science draws a hard line, which we transgress to our detriment.

The collapse of the cod fishery comes to mind, and we are hewing perilously close to this line on climate change. One can make a similar case for vaccinations, where the broader public health is at stake. For our collective well-being, we need clear and informed scientific voices at the table, particularly on issues where science can serve as an objective unifying force to break through partisan divisions that may be holding us back.

As the stakes become higher, academics are increasingly interested in reaching beyond their institutional circles, to bring their research more into the light of public and policy discourse. The door is opening for such contributions in Canada. While sustained commitment is needed, the bridge between worlds may soon be less of a leap.



04



EQUITY DIVERSITY, AND INCLUSION

POLICY CHANGE TOWARDS EQUITY AND INCLUSION IS GOOD FOR SCIENCE IN CANADA

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Campbell

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In 2019, the Canadian post-secondary education (PSE) sector, and particularly the research enterprise, saw the implementation of significant initiatives relating to increasing equity, diversity and inclusion (EDI) in research, across all disciplines, including all scientific research supported by the three tri-councils. Overall, research culture in Canada has historically moved toward equity at a glacial pace and is behind other jurisdictions such as the US, UK and Australia in adopting policy-driven approaches to improved EDI in PSE. In 2019, there are now a number of policy changes that include (but are not limited to) the requirement for all Canadian PSE institutions to develop equity plans, increased accountability in the CRC program, expectations of applicants to integrate EDI and SGBA+ analysis in grant applications, and mandatory peer-review training on implicit bias. Canadian institutions can now also voluntarily participate in the recently launched Dimensions: EDI charter, which expects

organizations to develop, implement and assess multi-year action plans which address their own institutional policies and programming initiatives towards identifying institutional structural and systemic biases that limit full participation of members of the federally designated groups (women, Indigenous peoples, persons with disabilities and members of visible minorities) and other under-represented communities (e.g., LGBTQ2S+).

The Dimensions charter builds on previous policy development, including the 2003 human rights challenge to the Canada Research Chairs program which has resulted in greater institutional transparency and accountability for the allocation and selection of Chair Holders (clearly outlined in the 2019 Addendum). Sadly, one leader of the 2003 challenge that created this transformational change in the sector, Dr. Wendy Robbins, did not live long enough to see the addendum put in place. Her legacy is a strengthened research enterprise in Canada and we should acknowledge her profound contributions.

The launch of Dimensions: EDI program builds on the foundational principle of continual improvement towards real equity and inclusion through iterative self-assessment and evaluation, rewarding institutions for developing action-oriented, data-driven and evidence-informed programs that improve their own equity, diversity and inclusion. This program is modeled on, but far more comprehensive and intersectional than, the Athena SWAN program in the UK, and provides a reputational boost for institutions who demonstrate explicit commitments and actions towards self-defined targets.

Submissions for participation and for evaluation are peer-reviewed and awards given or rescinded over time, as institutions iteratively improve. Institutions compete against themselves, not one another, which is perhaps a novelty for a sector often obsessed with rankings. In the UK, the Athena SWAN program has operated for over a decade and was recently assessed by an independent review team which reports that “there is strong evidence that the Charter processes and methodologies have supported cultural and behavioural change – not just around gender equality, but equality and diversity in all its forms”. Although Canada considered program development and implementation for many years, it required federal policy to translate a strong desire for change into the Dimensions program.

Organizational change can be protracted, particularly within universities and while recent progress in equity policy development is worth applauding, it can still feel like change is too slow and requires a constant chipping away at resistant and reluctant institutional structures and attitudes, requiring personal persistence and collective vigilance. Some pockets of resistance consider such change to constitute “identity politics” or “political correctness run rampant” but there is real economic value in change that leads to broader questions being asked by more diverse communities of researchers.

For example, the recent policy change to the consumption of cannabis has generated a new industry based on an under-studied plant. Only female plants are harvested for cannabinoids, while pollen-producing plants are used occasionally for breeding. Plant sex is largely determined by an XY chromosome system, just like humans, but can be manipulated through the use of hormone disruptors. Male (XY) plants can produce female flowers and female (XX) plants can produce male flowers (that produce pollen without Y chromosomes). This suggests that understanding a lot more about the biology of the

sex of these plants, and especially female plants, is commercially important (and is a major research goal of Dr. Lesley Campbell). But interestingly, research into the plant-breeding of agricultural crops has been historically a very male-dominated community of researchers which had typically overlooked or downplayed the relevance of maternal plant strategies to plastically respond to changing environments in providing resources for seeds (the next generation). The simple assumption was that there are "good genes" which must be selected for breeding of better crops and that the plasticity observed by maternal strategies was problematic "noise" within the system. More diverse teams ask more diverse questions and thus by studying female plants and potentially harnessing maternal care strategies, this flexible response to environmental change could

allow crops greater environmental breadth to serve a wider human population. Thus, policy changes that lead to greater participation of a diversity of researchers can facilitate a variety of new questions to be asked and bring forward a variety of approaches that perhaps had not been previously considered.

The proposed policy changes towards a real meritocracy are important because embracing equity means achieving real excellence in research, in innovation, in idea generation, in solution-finding, in production of outputs and breakthroughs. The benefit to Canadian society and the potential for enhanced economic development cannot be understated.

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Creating a Culture of Accessibility in the Sciences Project

Mahadeo

A. Sukhai

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ACCESSIBILITY AND INCLUSION IN THE CANADIAN SCIENCE AND INNOVATION LANDSCAPE



Diversity drives innovation. This statement is axiomatic in the research enterprise, as well as in the private sector. Different perspectives, as defined by different experiences, different backgrounds, and different ways of thought, are valuable in creative solution-finding. “Diversity drives innovation” is the clarion call surrounding inclusion initiatives in science, technology, healthcare, engineering and mathematics.

For persons with disabilities in STEM and healthcare, this axiom is much more challenging. Different perspectives and different ways of thought are not often correlated with different abilities in the minds of educators, hiring managers and policy makers. While persons with disabilities represent 22.5% of the Canadian population (Canadian Survey on Disability, 2017), the proportion of persons with disabilities in STEM and healthcare fields is demonstrably and significantly lower than that. Competency requirements in professional disciplines provide one established barrier, as does societal perceptions of ability, disability and access in scientific disciplines. A recent study of societal perceptions by the CNIB highlighting a general lack of confidence of the general population that persons with sight loss can be successful in technical fields is one example among many.

Societal perception of ability has been a generational problem. While the history of STEM is replete with persons with disabilities (Thomas Cavendish, Paul Dirac, Albert Einstein, Thomas Fisher, and Henrietta Leavitt, among many others), the proportion of persons with disabilities in STEM in the latter half of the 20th century is considerably lower (Temple Grandin and Stephen Hawking are two of the best known examples). This observation can be explained by many factors – increasing discipline specialization, the industrialization of the research enterprise, the rise of the postdoc as a component of one’s academic journey – but a significant factor remains a perception about what persons with disabilities can or cannot do in STEM and healthcare.

While we know that persons with disabilities are under-represented in STEM and healthcare, the exact extent of this is not fully clear. The stigma associated with disability has another consequence, that of reduced voluntary disclosure. After all, if one can attempt to succeed without disclosing one’s disability, why would you, knowing what your manager’s or supervisor’s attitudes might be after you disclose? More than 90% of all persons with disabilities are said to experience “invisible” disabilities – ones not evident to another person. People with physical and sensory disabilities are often thought to have “visible” disabilities by contrast – however, this is a logical fallacy, since significant majorities of people who are partially sighted or hard of

hearing are not obviously so.

The “numbers problem” that has arisen also feeds on itself and becomes somewhat circular. Inclusion initiatives in STEM and healthcare will often scope themselves toward gender, visible minorities, or Indigenous peoples specifically, and often the argument will be that there is limited or no need to consider persons with disabilities because they are not present in the fields anyway. Persons with disabilities who choose to highlight their experiences in STEM and healthcare may encounter a number of additional barriers: Managers and educators may serve as gatekeepers; attitudinal stigma from colleagues; isolation and resultant stress from being known as one of a small number of people with disabilities in their field (if not the only one); or a lack of appropriate educational and workplace supports. An additional barrier may arise where colleagues and supervisors may misperceive one’s intent in becoming a scientist in the first place. Over the past decade, the successful engagement of persons with disabilities in STEM and healthcare has become a more significant and mainstream topic within the education and policy landscape. Research initiatives examining barriers to career participation in STEM and healthcare disciplines have been launched. Human rights cases have gone forward against a few universities for exclusionary practices in doctoral and professional programs. One of us (MAS) has led several significant efforts to build educational resources for faculty and students.

The new Dimensions program is designed with a view toward all aspects of diversity and inclusion, and is inclusive of disability and accessibility – as the pilot unfolds, a better understanding of how accessibility is integrated within this program will develop. At the time of the first Canadian Science Policy Conference in 2008, a dialogue about accessibility in STEM and healthcare was significantly harder to start and maintain. Today, we move toward evidence-based policy and practice. Today, careers in equity in STEM and healthcare are viable; we hope that in the near future, a career in accessibility in STEM and healthcare will be just as viable to trainees who are interested.

Diversity drives innovation. Diversity is multi-dimensional. Different abilities lead to different ways of receiving, processing and communicating information – different thoughts, different perspectives. The next decade will bring increasing attention to accessibility in STEM and healthcare, with positive changes on the horizon.

05



INNOVATION POLICY: THE CANADIAN OUTLOOK

RECENT DEVELOPMENTS IN INNOVATION POLICY

Iain Stewart

President, National Research Council

David Côté

National Programs and Business Service Advisor,
National Research Council

Innovation is widely recognized as the primary driver of long-term economic prosperity and high living standards. While a country's capacity to innovate depends ultimately on the business strategies adopted by its private sector, the government nonetheless has an important role to play by helping to foster an innovation-friendly policy climate and providing support for the various inputs to innovation, such as talent and research and development (R&D). This brief article provides a high-level summary of the Government of Canada's efforts on this front over the past decade, before concluding with some thoughts on potential areas for future consideration.

During the 2006-16 period, the government's innovation strategy built on the substantial efforts of the preceding decade focused on supporting the performance of R&D and the development of talent by the academic sector—efforts such as the creation of the Canada Foundation for Innovation, the Canada Research Chairs, and the Canada Graduate Scholarships. Key measures in 2006-16 included the introduction of new talent-focused programs (e.g., the Vanier Canada Graduate Scholarships and the Canada Excellence Research Chairs) as well as programs to build connections between academia and business (e.g., the Business-Led Networks of Centres of Excellence and the Centres of Excellence for Commercialization and Research).

At the same time, the "supply-push" of academic ideas and talent into the business community was complemented by "demand-pull" initiatives intended to incentivize individual firms to compete on the basis of innovation. Long-standing tools like the Scientific Research and Experimental Development tax credit, the Business Development Bank (BDC), the Industrial Research Assistance Program (IRAP), and the regional development agencies (RDAs) were leveraged to encourage firms to take risks and experiment with new ideas.

The Innovation and Skills Plan, announced in Budget 2017, represents a strategy to push previous efforts even further and "make Canada a world-leading centre for innovation." A major pillar of the plan is the new Innovation Superclusters Initiative, which combines leading Canadian firms, small- and medium-sized enterprises (SMEs) and advanced technology providers into five innovation clusters across the country. The National Research Council of Canada (NRC) is strongly committed to this initiative's success, having established a series of multi-year R&D programs that complement the superclusters, in addition to providing support in the form of staff, facilities and expertise.

Another key component of the Innovation and Skills Plan consists of consolidating key business support programs into a redesigned Strategic Innovation Fund that supports larger innovation projects. In addition, the plan includes the launch of Innovative Solutions Canada, which leverages federal procurement to stimulate SME innovation. Furthermore, it increases funding for IRAP and the RDAs to support

larger SME technology projects and assist firms to grow to scale. Scaling-up innovative SMEs has also included greater BDC investments and enhancements to the Trade Commissioner Service to better assist exporters in accessing global markets.

With its focus on improving service delivery to business clients and accelerating the growth of innovative firms, the Innovation and Skills Plan is a step in the right direction. As Peter Nicholson recently reminded us, however, successive governments over many decades have sought to move the needle on Canada's business innovation performance, always with the same result: on the whole, albeit with some notable exceptions, the country has persistently ranked poorly on key measures of innovation, notably productivity growth (especially multifactor productivity), business expenditures on R&D, and business investments in machinery and equipment. Canada's chronic underperformance on these measures is particularly troubling in view of a number of powerful socio-economic trends, including globalization, sustainability concerns and the aging population, which will require Canadian firms to innovate more than ever in order to maintain our high living standards.

In light of the foregoing, it is clear that, promising recent efforts notwithstanding, Canada must maintain an unwavering commitment to the promotion of business innovation. The following are a few considerations that may help inform ongoing efforts in this critical area:

- While it is important to continue offering robust support for R&D and talent development within the academic sector, innovation policy must focus more on "demand-pull" measures that incentivize firms to embrace business strategies rooted in innovation. Examples of demand-pull measures include innovation-oriented public procurement, regulatory policy, and competition policy, to name a few.

- Because innovation is a cross-cutting activity that spans many sectors of the economy, addressing it requires a whole-of-government approach. While recent efforts have been made to create a whole-of-government program suite, significant opportunity remains to better coordinate program activity, especially in support of targeted areas of strategic importance and opportunity, such as genomics, quantum research, advanced materials, and digital technology including artificial intelligence and cybersecurity. Public servants in program delivery must work closely with their policy counterpart—and each other—to ensure that the government is providing an intelligent suite of coordinated programs.

- It is important to ensure that Canadian businesses are aware of the latest technologies and able to incorporate them into their business strategies. Whole-of-economy efforts are required for firms to self-assess their use of the latest technology, identify firm level-gaps, and then be supported with advice and demonstrations about the latest tools and ideas in their markets.

The NRC looks forward to continuing to advance Canada's innovation agenda, in close collaboration with its partners across government and in the private, academic and non-profit sectors. If we all work together assiduously, the 21st century will doubtless be an exciting time for Canadian innovation!

CANADA AT THE FOREFRONT OF INNOVATION

Karimah
Es Sabar

CEO & Partner, Quark Venture LP

From the discovery of insulin, to the invention of the world's first pacemaker, to the first clonal method to identify stem cells and the discovery of transplantable stem cells, to HAART therapy treatment for HIV prevention, or to the first coated stent in the world, Canada's innovative life sciences industry has the essential components to compete globally and has achieved a successful track record of fostering start-up health and biosciences firms. Yet in spite of this potential, Canada currently has very few homegrown global anchor firms, such as Sanofi Pasteur [previously Connaught Laboratories], in the health and biosciences sector.

Canada's universal health-care system is a source of national pride, and the Canadian health and biosciences sector is a key source of high-paying, quality jobs, employing more than 91,000 people directly and some 2.1 million within the broader health system. The health and biosciences industry is also a significant contributor to Canada's economy. The industry contributed \$7.8 billion to Canada's GDP in 2016 and has tremendous growth potential. Areas poised for growth include digital health, which is due to be a \$233-billion global market by 2020, and precision medicine, which is set to be an \$88-billion market by 2023. Our Canadian health and bioscience companies are well aware of the brimming opportunities in the sector, and have world-class solutions. All over the country, Canadians are leveraging cutting-edge technologies to bring about the health solutions of tomorrow. Our researchers, inventors and entrepreneurs are following our strong tradition of innovation and developing breakthrough products—but we don't do enough to shine a spotlight on our successes. Here at home, the public needs to be more aware of the brilliant innovations being developed right here in Canada. Our public health systems need to have the confidence to back Canadian innovations, as well as the capacity to reach out to our innovators for Canadian-based solutions to issues related to services, delivery and care. We need to let our homegrown talent shine and grow, knowing that once we give them the scope to expand in Canada, they can then succeed globally. Further afield, attracting skilled talent from around the world would be expedited if we did more to ensure that Canada is rightfully recognized abroad as an economic powerhouse and a place to contribute to health solutions with global impact.

We need to strengthen the entire innovation ecosystem to get Canada on the trajectory to become a world leader and to significantly move the needle towards an innovation economy of the future.

This was discussed at the HBEST [Health and Biosciences Economic Strategy Table] by industry leaders and a vision, goals, targets and recommendations for action established. Five areas were identified by HBEST as priority:

- 1) Accelerate innovation adoption by employing value-based procurement within Canada's health systems and establishing a procurement innovation agency
- 2) Create a modern, agile regulatory system by

adopting international best practices, eliminating duplication across jurisdictions and decreasing review times

- 3) Harness the potential of digital technology by creating a national digital health strategy featuring an interoperable digital health platform

- 4) Develop and attract world class talent by equipping Canadians for highly skilled jobs, eliminating hiring barriers and streamlining government skills programs

- 5) Drive the creation of anchor firms by mobilizing late-stage capital, scaling-up high potential firms, and broadening research and development tax incentives

Health spending represents a sizeable proportion of our gross domestic product, and there has never been a better time to leverage this investment to produce greater health outcomes and economic prosperity. By seizing the moment, we can better enable Canadian-based innovations and companies to grow within Canada as a jumping-off point to global leadership, focused on value-based products that aim to improve patient care and outcomes. Our collective commitment to streamline regulations, enable cutting edge technologies to reach the marketplace, advance digital health technology and grow firms to scale will transform the health and biosciences ecosystem to the benefit of all Canadians.

An innovation economy will enable us to be the nation that provides an enviable quality of life, superior education, liveable cities and world class health care. A nation that is driven by a highly competitive and compassionate industry that fundamentally cares about people, our society and our future. A nation that brings prosperity to Canadians through innovation, investment and job creation.

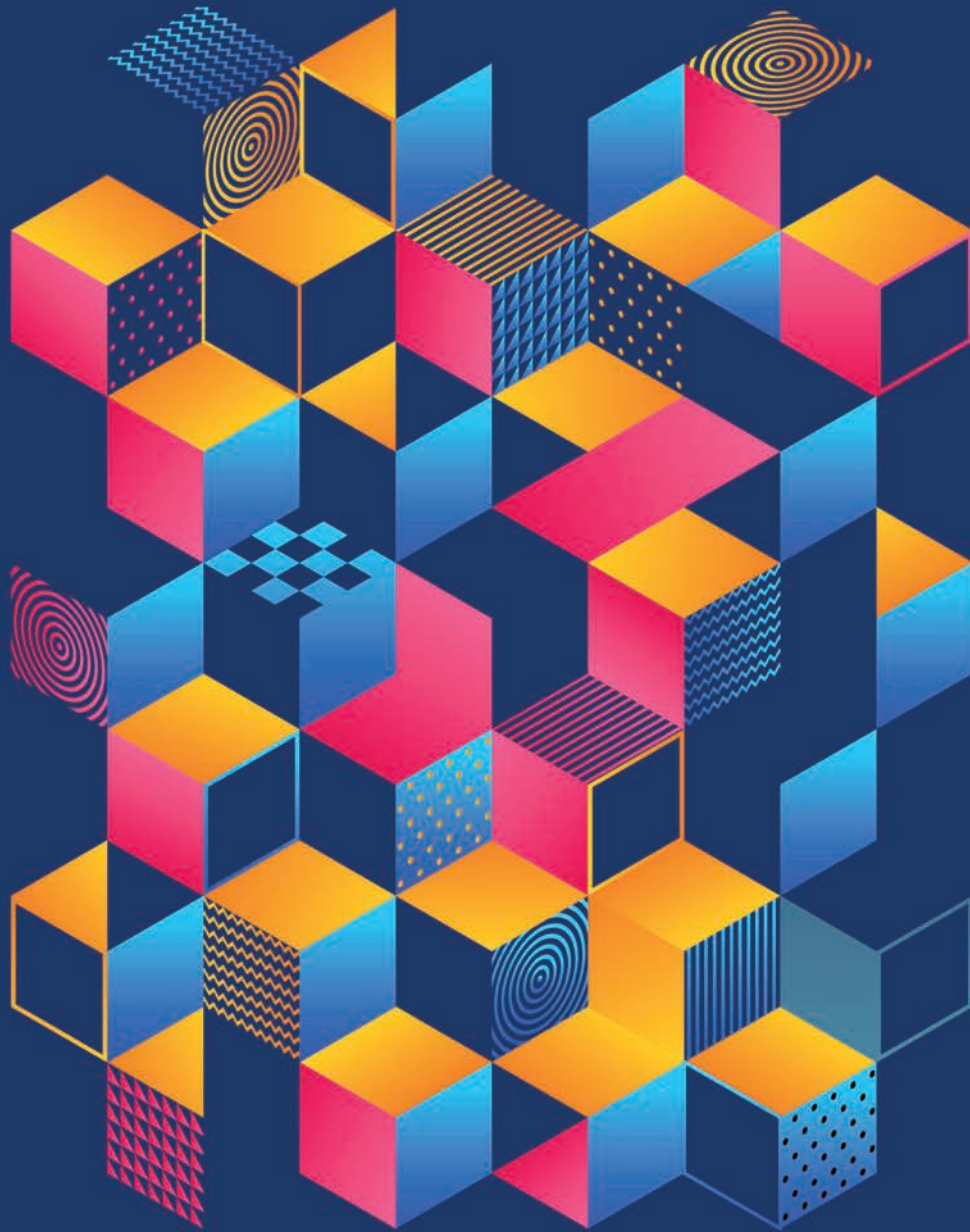
As an industry we share the same goals and same challenges. The way to move forward and embrace the innovation economy is through a shared vision and collaboration.

It's a Herculean task but, its about creating an innovation economy that sustains us, attracts and retains talent and lays the foundation for generations to come.

Knowledge and innovation are renewable resources and Canada has the right ingredients to become the most globally connected, innovative country in the world.

Canada has to create its own Future to be sure what it will look like!

06



INDIGENOUS KNOWLEDGE

SCIENCE POLICY IN INUIT NUNANGAT – MOVING FROM “INDIGENOUS KNOWLEDGE” TO INUIT SELF-DETERMINATION IN RESEARCH

Natan Obed

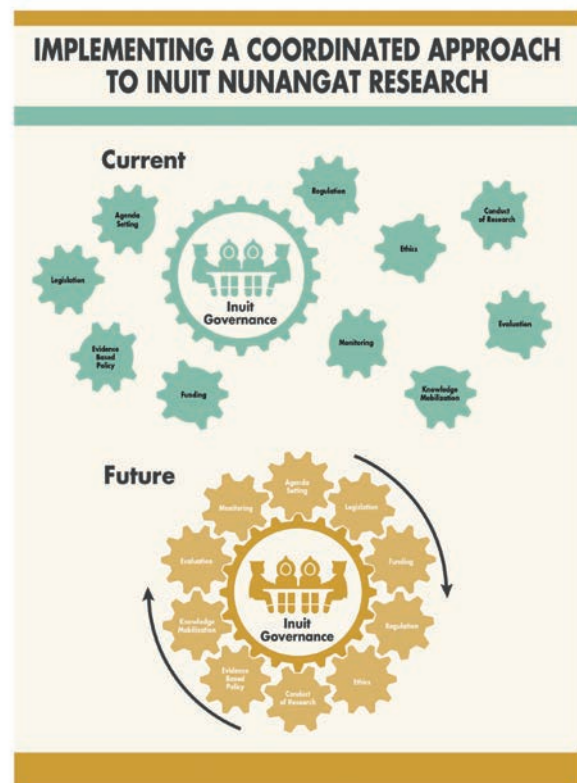
President, Inuit Tapiriit Kanatami (ITK)

It is time to end the research community’s unhelpful focus on integrating Indigenous knowledge into science and policy and replace it with a focus on advancing Inuit self-determination in all aspects of research through partnerships between researchers, research institutions, and governments, and Inuit rights holding organizations. The research community has positively responded to calls by Inuit, First Nations, and Métis to respect and support the integration of Indigenous knowledge into research projects, policies, and initiatives. However, an unintended negative consequence of this trend vis-a-vis Inuit is that the discourse around Indigenous knowledge is often wielded to limit Inuit participation in research projects, policies, and initiatives to their Indigenous knowledge components. Despite being characterized as part of a progressive research agenda, the focus on Indigenous knowledge all too often maintains the status quo of limiting Inuit involvement in research to the role of passive research subjects. Inuit seek to permanently transform this colonial paradigm through the advancement of Inuit self-determination. Inuit are rights holders in Canada and have the right to self-

determination. This right extends to research and the many facets of the research process. ITK developed and released the National Inuit Strategy on Research (NISR) in 2018 as the roadmap for achieving this goal. The NISR establishes Inuit expectations in the areas of research governance, ethics, data and information ownership and control, capacity building, and priority setting. It advocates for a distinctions-based approach to the development and implementation of research policy rather than a pan-Indigenous one. It affirms the role of Inuit as rights-holders in our homeland rather than stakeholders or research subjects, and promotes the need for the federal government to develop and implement an Inuit Nunangat research policy as a means to enhancing the effectiveness and impact of Inuit Nunangat research.

To accomplish this vision, the NISR advocates for a coordinated approach to research carried out in our homeland based on equitable partnerships. The NISR advocates for dismantling the imbalance of authority in research, science and policy. This entails shifting away from research about Inuit, to investing in and supporting research partnerships with Inuit that reflect Inuit research priorities. This is the only means to ensure that Inuit Nunangat research is effective and impactful and can positively inform policies that impact our day-to-day lives.

Caption: Originally published in the NISR, this image shows what a coordinated approach to Inuit Nunangat research looks like.



Larissa Crawford

Indigenous Researcher, Government of Canada
Founder, Larissa Crawford Speaks

ENVIRONMENTAL SCIENTISTS AND POLICYMAKERS HAVE A SHARED RESPONSIBILITY TO RECONCILIATION TOO

Even as an Indigenous person working in energy and environmental policy, I can appreciate confusion around what "reconciliation" means to the work. There can be no 'blanket', quantified, or final response to this inquiry, as it is very much subjective to the Indigenous Peoples we work with, or the traditional lands on which we occupy.

However, for the purpose of this article we may generally understand reconciliation as:

- the action of righting wrongs, while recognizing that not all wrongs can be righted;
- to begin with the creation of a shared history through education, with the intent of understanding how we came to be where we are; and
- to define and act on our roles in a shared responsibility to move forward.

This understanding of reconciliation comes from the words of Robin Bradasch, member of the Kluane First Nation and Director of Governance for Crown Indigenous Relations and Northern Affairs.

I first met Bradasch on an Action Canada Fellowship study tour this summer in Whitehorse, Yukon, where she discussed her role in laying the groundwork for the Healing Broken Connections project (2004-2008).

In 1948 the Champagne and Aishihik First Nations and the Kluane First Nation experienced violent separation from their traditional lands when it was designated as the Kluane Game Sanctuary. Although the Sanctuary became a National Park Reserve in 1972 and hunting and harvesting rights were technically restored, the 5-year project was initiated in 2004 to facilitate the reintegration of citizens back to the land in recognition that trauma and broken relationships were acting as barriers to their return. The relationship reparation that took place in this project allowed for the co-management regime negotiated prior to the project to be better implemented. Furthermore, Healing Broken Connections successfully defined and included “cultural reintegration”- the return of the original peoples to the land- as an indicator of the park’s ecological integrity. This is regarded by many as a shining example of reconciliation.

When I asked Bradasch what she would want more environmental scientists and policy makers to know about Indigenous knowledge and their responsibility to “reconciliation”, her mind immediately went to an experience early in the Healing Broken Connections project: “We were talking about reintroducing [the original people] to the

“We were talking about reintroducing [the original people] to the park... and it was so frustrating to me that [the scientists] were not able to recognize that people had been removed, and that that had had an impact. Not only an impact on the land, but an impact on the people. There was such a lack of understanding around the true connection Indigenous People have with the land.”

park... and it was so frustrating to me that [the scientists] were not able to recognize that people had been removed, and that that had had an impact. Not only an impact on the land, but an impact on the people. There was such a lack of understanding around the true connection Indigenous People have with the land.”

Bradasch is right to be frustrated. Removing the First Nations Peoples from the Kluane Game Sanctuary and the ecosystems within which they belong to did have imbalancing effects on the ecosystem, particularly in regards to uncontrolled wolf population in the absence of necessity-based hunting by the First Nations Peoples.

As environmental policymakers and scientists, one of our first barriers to reconciliation work is rooted in the frustration identified by Bradasch: to say Western science is neutral and objective, and therefore the superior way of knowing, is to engage with a norm that has been weaponized against Indigenous Peoples- knowingly or unknowingly- resulting in the delegitimization of our traditional

knowledge, the displacement from our traditional lands, and the cultural genocide we continue to face.

Using again the example of protected areas to demonstrate the point above, let us consider that traditionally protected areas have been erected in regions deemed undisturbed by humans- “wilderness” that is defined by the separation of people from nature. As argued by Roberta Nakoochee in Reconnection with Asi Kéyi: Healing Broken Connections’ Implications for Ecological Integrity in Canadian National Parks, although this may in itself appear to be a simple distinction based on scientific findings and environmental assessments, the terra nullius approach to “wilderness” is one that does not meaningfully acknowledge Indigenous Peoples occupancy of and traditional use of said land. The removal of the Kluane First Nations and the Champagne and Aishihik First Nations during the initial creation of the Kluane Game Sanctuary, and as another example the later eviction of First Nations and Metis Nations in the establishment of Jasper National Park, reflect not-uncommon consequences of said objectivity. Furthermore, Indigenous Peoples commonly understand humans as an integral part, and not separate from, nature. Displacement from land is a form of cultural genocide because our livelihood, education, stories, spirituality, language, and ancestry are deeply connected to that land, and when violently removed from that land the trauma inflicted is experienced throughout generations.

An understanding of shared history and responsibility to reconciliation is preceded by the recognition that Indigenous ways of knowing and experiences are just as valid as Western counterpart. Bradasch urges that “scientists need to recognize that there are more ways of knowing; Indigenous ways of knowing are just as valid and that it’s important that we need to stay open-minded.” To be “open-minded,” she acknowledged, is basic in its articulation but complex, sometimes uncomfortable, and often laborious in its increasingly necessary execution.

In the wave of climate change mobilization we are currently amidst, urgency and power is being placed in the hands of environmental policy makers and scientists. If we are to make effective, sustainable, and ethical contributions to Canadian society and environment, we must be open to understanding and acting on our shared responsibility to reconciliation.

SCIENCE POLICY AWARD'S OF EXCELLENCE

2019

Emily De Sousa
Title of Policy Proposal:
Eliminating Seafood Fraud:
A Fishy Approach to Food Policy



2018

Jessica Kolopenuk
Title of Policy Proposal:
An Indigenous Approach to
Canada's National Missing
Persons DNA Program



2017

Sierra Clark
Title of Policy Proposal:
Residential Woodburning in
Canada: Health and Climate
Effects and Intervention
Strategies



2016

Amani Saini
Title of Policy Proposal:
Using Genetic Tests to Prevent
Adverse Drug Reactions



2013

Ari Cuperfain
Title of Policy Proposal:
Increasing Industry R&D
and University Researcher
Collaboration through
Community of Practice





07



EMERGING LEADERS



President & Founder, Adverse Drug Reaction Canada

ON WINNING THE 2016 CANADIAN SCIENCE POLICY AWARD OF EXCELLENCE

I was incredibly honoured to receive the 2016 Canadian Science Policy Award of Excellence (under 35 category), for my policy proposal to prevent adverse drug reactions (ADR), Canada's 4th leading cause of death. Sometimes one has an idea, but they need the encouragement to pursue it.

This is what the award provided me. In 2010, my younger sister nearly died from an ADR, after a physician gave her a pill to take for her common cold. In the years after, I learned that up to 22,000 Canadians die each year from ADRs, thousands more suffer from the consequences of them and they cost the health care system billions of dollars each year, but still no real solution exists in any Canadian jurisdiction to prevent ADRs from happening.

I was fueled by anger at the lack of government action to prevent ADRs, especially when I learned that they were being prevented in our countries. Therefore, I decided to develop a policy solution to prevent ADRs in Canada. I had the desire to act on my idea, but wasn't sure how it would be perceived and whether it was deemed plausible. By winning the award, my policy idea was given validation by the science community and this opened the door for it to flourish. The win gave me the assurance and confidence I needed to start a national organization, Adverse Drug Reaction Canada (ADR Canada) (www.adrcanada.org).

My winning proposal became the foundation of the organization, which advocates for genetic testing to identify gene variants that cause ADRs, the creation of a national database to monitor and record ADRs, and the creation of an electronic medical record system.

As ADR Canada continues to grow, engaging Canadians in dialogue about their healthcare system, communicating about science and evidence, we have had several successes. For example, earlier this year we worked with a political party in the Yukon to write a motion calling on the Canadian government to improve reporting and mitigation of ADRs. In April, this motion was tabled and then debated in the Yukon Legislative Assembly.

It passed unanimously and a letter was sent to the federal Minister of Health with the signatures of all three party leaders in the Assembly. ADR Canada will take similar actions in other jurisdictions across the country over the coming years as it works to create a country free from ADRs.

Homa Kheyrollah Pour

Assistant Professor
Canada Research Chair in Remote Sensing of Environmental Change
Department of Geography & Environmental Studies
Cold Regions Research Centre
Wilfrid Laurier University

EMPOWERING THE NEXT GENERATION IN SCIENCE POLICY



Understanding my strengths, interests, values, and personality was the first step toward choosing my career path in environmental studies and subsequently in becoming an Assistant Professor at Wilfrid Laurier University. In particular, I've worked hard to improve my transferable skillset which could then be used in many different work environments, regardless of the sector.

Transferable skills can be attained in many different ways including volunteering for a not-for-profit organization, doing community service, working part-time jobs, internships, or taking academic courses. What helped me on my academic career path was to volunteer for the CSPC Program Development team started back in 2016. It taught me invaluable lessons about the bridge between academia and policy.

The new generation of scientists face society's expectation that scientists both objectively produce knowledge for evidence-informed policy-making while also integrating knowledge from multiple disciplines to provide solutions and tools to end-users. Our audience has also broadened – we are expected to communicate the science with stakeholders in government agencies, NGOs and the public. Finding new and effective ways for the scientist to step up to meet these expectations and bridge the gap between science and policy is crucial in today's world and scientists have a great responsibility for this. These are critical challenges for me personally as a scientist as the platforms to learn and practice these skills have been limited.

It was through CSPC that I have become a better communicator and learned how researchers and policymakers can work together to help to increase the use and impact of evidence-based research in policy.

That to me is the biggest impact of CSPC in the past decade, training a new generation of scientists in science policy.

Uzma Urooj

A contribution to the inaugural edition of CSPC Magazine celebrating a decade of CSPC impact

Uzma has been part of the CSPC family since 2015 and continues to be an active member providing innovative ideas in various capacities to ensure that CSPC remains a positive platform for the emerging and established science policy practitioners in Canada. Uzma joined the CSPC as the Coordinator of Science Diplomacy Symposium and the member of the Program Development committee. Between 2016 and 2018, Uzma led the Program Committee as co-chair and was the member of the Special Events committee. This year, Uzma has moved on to chairing the newly established Evaluation Committee. Professionally, Uzma is trained from the University of York, UK (PhD, Cognitive Neuroimaging) and University of Toronto, Canada (BSc Honors, Neuroscience and Linguistics). She joined the Canadian Federal Public Service after dabbling with technology transfer and research management in the academic setting. Currently, Uzma works for the Canadian Institutes of Health Research (CIHR) as Advisor, Science Strategy working on improving the training and capacity development of Canadian highly qualified individuals, including graduate students and early career researchers.

CSPC volunteers are like a family who keep coming back year after year with endless ideas and energy that, in itself, is so refreshing to be surrounded with. CSPC has earned me genuine friends for life!

MY EXPERIENCES OF VOLUNTEERING WITH THE CANADIAN SCIENCE POLICY CENTRE

To me, the only way any knowledge gained through scientific research can have the maximum impact is when it is properly implemented and integrated within policies that shape our society and economy. Scientific research is important for increasing our knowledge of the world. Equally important is the understanding of the social and political environment in which this knowledge resides.

When I moved back from the UK after completing my PhD in Cognitive Neuroscience, I was looking for a platform to understand the Canadian science policy landscape. My international experiences had piqued my interest about how science is leveraged differently in different countries. I had started noticing that scientific knowledge, when managed and leveraged properly, can be a great asset for the society as a whole. So, when I stumbled upon CSPC in one of my web searches, it became apparent that through CSPC, I could understand the nuances of Canadian science policy like never before. When I attended my first CSPC conference back in 2015, what struck me the most was how CSPC was equally able to attract and engage students, emerging science policy practitioners and senior policy experts responsible for design and implementation of Canadian policy in all levels of government. This, to me, is the triumph of CSPC.

My decision to volunteer for the CSPC has been one of the best decisions that I have made in my career so far. CSPC may not have influenced my career directly, but it certainly has played a huge role in broadening my horizons, expanding my professional network and helping me understand the Canadian Science Policy landscape. Volunteering with CSPC has helped me confirm what I am passionate about. I can truly say that through volunteering, I have learned so much about myself and about the activities that bring me joy. CSPC has also provided me with a platform to lead in various capacities. Each of those leadership experiences have helped me learn about my leadership style and how to motivate people around me. As a long-term volunteer for CSPC, I have grown as a leader, learned to ask critical questions and gained a nuanced understanding of the vast array of science policy topics. My experiences have taught me that networking does not always have to occur in traditional settings. Being of service and getting to know others on a personal level can be a great form of networking in itself, helping one grow in unimaginable ways. I am fortunate to have worked with amazingly talented people who are equally passionate about the possibilities of science for the society and the economy. CSPC volunteers are like a family who keep coming back year after year with endless ideas and energy that, in itself, is so refreshing to be surrounded with. CSPC has earned me genuine friends for life!

A lina Chan

Human Frontier Science Program Postdoctoral Fellow,
the Broad Institute of MIT & Harvard



BEING A PART OF THE CSPC FAMILY

This is my third year volunteering with the CSPC and my first year co-chairing the program committee, which coordinates 50+ panels and shapes the content of the annual conference. Being a CSPC volunteer has allowed me to meet friends and mentors across diverse fields of science and policy that I otherwise would not have crossed paths with as a Canadian postdoc in Boston. This year alone, the program committee is comprised of scientists, strategic analysts, scientific officers, policy advisors, consultants, program leaders, academics, and three Canadian research chairs! I learn so much every year about what's on the forefront of Canadian Science policy by being a part of the team that reviews the many panel applications (the number keeps increasing each year!) to ensure an incredible selection of topics and speakers at the CSPC.

The first time that I attended the CSPC, I was just blown away by the scale of the annual meeting, where the Minister of Science, the Honourable Kirsty Duncan; the Governor General, the Right Honourable Julie Payette; the Chief Science Advisor, Dr. Mona Nemer; and the Director of the Perimeter Institute, Dr. Neil Turok gave addresses at the CSPC and its gala. This year, as a program committee co-chair, I was just as awed by the scale of the behind-the-scenes efforts by dedicated CSPC volunteers to bring about this amazing and essential Canadian Science Policy Conference. I feel that the CSPC has played a pivotal role in creating a robust science policy network across Canada, as well as a family of CSPC volunteers who come together from so many different parts of Canada (and the US) to organize this conference each year.

It's been a great pleasure to work with Mehrdad and other CSPC volunteers to build the program of the annual conference.



Alessandra Zimmermann

Executive director, Proposal analytics

HOW CSPC HAS HELPED ME

I first heard of the CSPC in February of this year when I volunteered as an aide during a panel at the AAAS National Meeting. I was a STEM graduate student that had strong science policy interests but lacked the ability to act in the traditional policy volunteer routes – as a campaign volunteer – due to my hectic research and teaching schedule. The CSPC invited me to participate in their boards, allowing me to participate at the level I could manage, and encouraged me to contribute my existing skills to new projects.

This incredibly student-friendly model of volunteering has allowed the boards to be populated with a huge variety of early career scientists, generating very active conversations about not only the center and its projects, but also how these projects can help promote diversity and inclusion to better the Canadian Science Policy landscape for decades to come.

This idea that the younger generation are going to shape the future has been evident throughout my tenure in the organization, and nowhere more so than in the creating of this magazine. The board, largely comprised of graduate students like myself, have been allowed to spearhead the effort, making it both a truly inclusive and diverse item, but also one that is facing towards the future.

We have been able to broaden our network and skills through this undertaking, and I truly hope that you enjoy this publication so that we can make it an annual event that brings both the old and new blood in science policy together to think about what needs to be done next.

S hawn McGuirk

PhD candidate at McGill University, long-standing board member and past president of Science & Policy Exchange, and Senior Policy Advisor at the Natural Sciences and Engineering Research Council of Canada (NSERC)

BUILDING BRIDGES FOR THE NEXT GENERATION OF SCIENCE POLICY EXPERTS

Building bridges is a long-term process. Ask anyone from Montreal. They are created through time and effort, require vigilant upkeep, and often several of them are necessary to open up an island to diverse new areas and to accommodate the number of eager travelers. Like my home city, academia is an island that exists within a much larger world — one where non-academic careers are becoming the norm. Many bridges lead to the private sector; some are high-risk, but in many cases the skills and knowledge gained in academia can be applied to navigate these paths. The path towards policy, however, can seem foreign and uncertain for newcomers.

It is from this uncertainty that Science & Policy Exchange (SPE) was established. Many will know of SPE from their grassroots nationwide initiatives like the #Students4theReport campaign in support of the Fundamental Science Review for the 2018 federal budget, or for their national trainee survey on the Canadian scholarships and fellowships. But SPE came into being in 2009, soon after the first Canadian Science Policy Conference, by graduate students in Montreal who saw no clear platform for students to explore the intersection of science and policy.

No more than a student group at the time, they set out to organize a yearly meeting to foster dialogue between students, scientists, industry leaders, and policymakers. For five years, the SPE Conference tackled key issues that remain relevant for Canada today, from the PhD bubble to the state of innovation in Canada, and from



exploring renewable energy to regulating medically assisted dying. Hundreds of students (myself included) were engaged and were given the opportunity to network with experts outside their usual sphere of influence.

Over the following years, SPE matured with new ideas from student leaders and through expert advice, becoming first a non-profit and finally a registered Canadian charity. The SPE Conference gave way to CSPC panels, policy cafés and student consultations, and public policy forums on genetic screening, microplastics, cannabis, or the opioid crisis. SPE also established a long-running dialogue with Quebec's Chief Scientist Rémi Quirion and their Intersectoral Student Committee, a collaboration which notably led to fruitful meetings with Sir Peter Gluckman, the 2016 launch of New Zealand's own "Science Policy Exchange", and to a 2018 symposium aligned with Canada's G7 presidency to discuss the role that students can play in science diplomacy.

Viewed from the outside, ten years on, SPE seems to keep changing focus. Volunteers ebb and flow, events and topics change over time, however the central mission has been constant — to promote the inclusion of research trainees as stakeholders in science policy. Each of the initiatives above, from 2009 to 2019, was an idea pitched by a student or postdoc, then coordinated by a group of students and postdocs determined to find a way. It is from the determination of hundreds that, over a decade, SPE has become Canada's leading science policy non-profit organization directed by research trainees.

My first step on the bridge from science to policy was in 2013, at the fourth SPE conference, and at the time I had no idea where it would lead. It is by engaging with SPE and many other initiatives as they

emerged (most recently, a Mitacs Science Policy Fellowship) that I found my way into the public service. Thankfully, the path looks much brighter and busier now than it did a decade ago.

In the last year alone: Mitacs began guiding its fourth cohort of fellows into the federal and BC provincial governments, Science Outside the Lab North hosted its fifth and sixth cohorts of young scientists, Research Canada focused a Parliamentary Health Research Caucus luncheon entirely on the student voice, and Canada's Chief Science Advisor Dr. Mona Nemer launched a call to establish a Youth Advisory Council, which received over 1000 nominations.

Students and postdocs also led the charge, with the Toronto Science Policy Network (TSPN) entering its second year, the Vancouver Science Policy Integration Network going strong, and the ambitious American National Science Policy Network expanding across the US through symposiums, microgrant initiatives, and policy memo writing competitions. As for SPE, it is stronger than ever, with a great new set of leaders ready for the challenges ahead of them.

Evidence for Democracy, Acfas, Universities Canada, and other non-profits also continue to engage young scientists broadly. Importantly, CSPC continues to be a convening point for bringing new voices into the science policy community, from the continued inclusion of Jeff Kinder's Science Policy 101 symposium session, the prestigious Science Policy Youth Award competition, and an increasing number of panels submitted and presented by the next generation.

Building bridges is a long-term process. Let's keep fortifying this path, together, and light the way for new generations to make their way across.

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