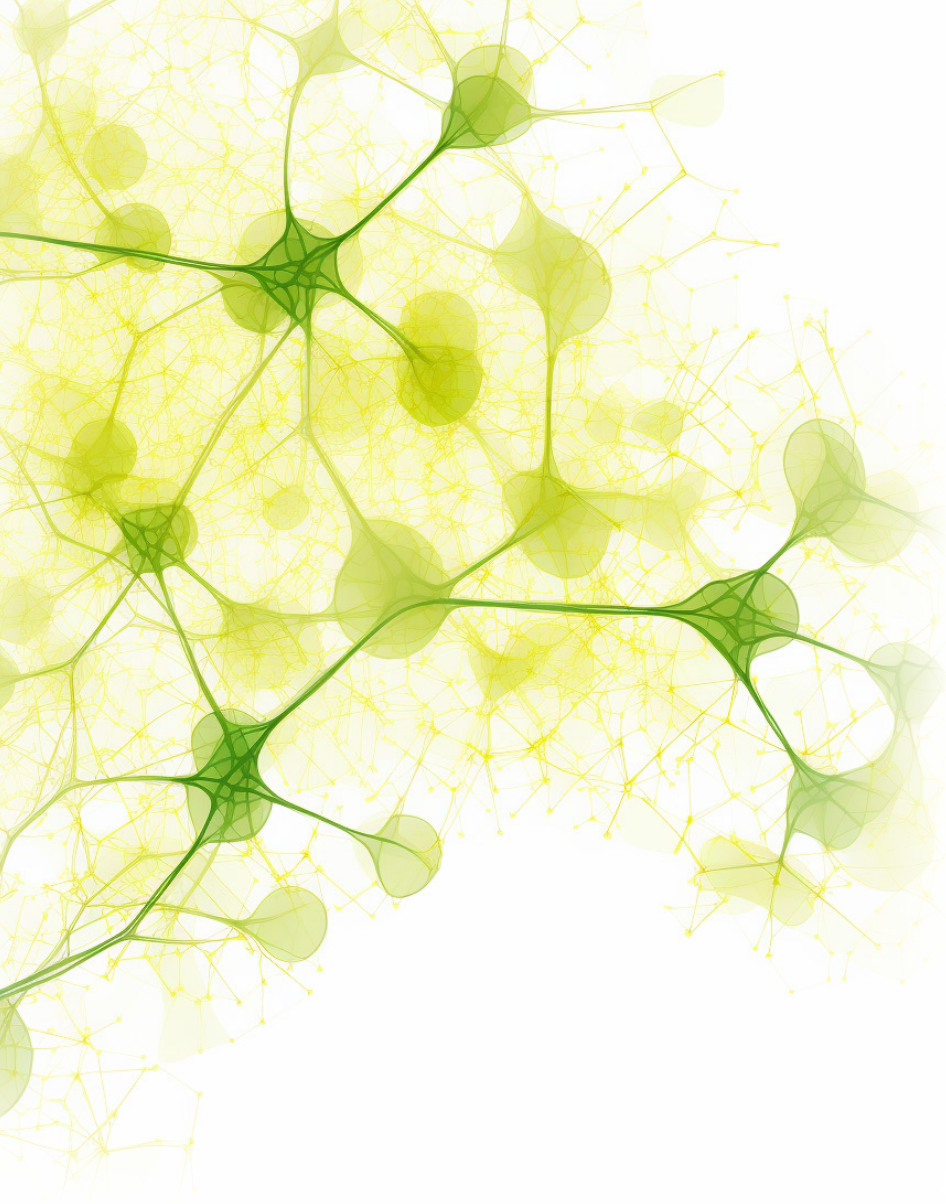


ANNUAL REPORT OF THE  
Chief Science  
Advisor  
..... 2022–2023 .....





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## Chief Science Advisor of Canada (2023)

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# A Message from the Chief Science Advisor

I am pleased to present this 2022-23 annual report of the Office of the Chief Science Advisor (OCSA). This is the fifth annual report issued by my office since it began operations in September 2017, and the first since the renewal of my mandate in the fall of 2022.

When I took up this position six years ago, many of Canada's international allies and partners already had a chief science advisor within their governments. The United States, Canada's closest ally and most important partner in scientific collaboration, had a chief science advisor through the cabinet-level White House Office of Science and Technology Policy, first established in 1976. Many other countries — the United Kingdom stands out as an example — featured, within their bureaucracies, well-established networks and systems for delivering science advice to key decision-makers and for championing scientific research.

In announcing the creation of the OCSA in 2017, Prime Minister Justin Trudeau characterized it as part of the government of Canada's efforts "to restore science as a pillar of government decision-making," allowing science advice to "inform decisions made at the highest levels."

In addition to the provision of science advice to government, the OCSA was also tasked with promoting a culture of scientific excellence in Canada writ large. Beyond the halls of government, Canada's scientific capabilities, built up during the decades following the Second World War, had made the country a global science leader, yet our enviable status was not reflected in Canadians' sense of themselves or their country.

The OCSA has worked steadily to fulfill those expectations. From the outset, this Office has endeavoured to raise the profile of science within government. It has built a network of science advisors within the federal workforce. It has drawn Canada's brightest scientific minds to serve on advisory task forces to help policymakers understand emerging and emergent issues such as covid-19. This Office has supported scientific excellence both inside and outside government by, among other initiatives, promoting diversity and openness in science and encouraging strategic approaches and investments in critical and developing areas. It has championed the role of science in Canada's economy, culture and international relations.

For all these efforts and accomplishments, much remains to be done. The task of modernizing the government's science advice networks, while much advanced, is not yet complete. Canada also needs a renewed science and technology strategy to maintain its status as a global leader. And it needs to make science and research part and parcel of its international relations, in terms of diplomacy and trade. In addition to reviewing the OCSA's progress from the past 12 months, this 2022-23 OCSA Annual Report also provides some reflections on the lessons learned from the past five years, and on future directions and priorities for the years ahead.



A handwritten signature in black ink, appearing to read 'Mona Nemer'. The signature is fluid and cursive.

**Mona Nemer**

Dr. Mona Nemer, C.M., C.Q., FRSC  
Chief Science Advisor of Canada

INTRODUCTION

# Amplifying our Strengths: Securing a Brighter Future for Science in Canada

The Office of the Chief Science Advisor (OCSA) was created in September of 2017 with a mandate to support the Government of Canada’s science functions and improve the flow of science advice to decision makers. Its mandate also includes license to “promote a positive and productive dialogue between federal scientists and academia, both in Canada and abroad, and raise awareness of scientific issues relevant to the Canadian public.”

This mandate is an especially pertinent one for our times. Every societal challenge that Canada currently faces, from climate change to mental health to aging populations and beyond, will require scientific advances that can translate into new technologies, new products, processes, treatments and services, and new social innovation. And the pursuit and implementation of such solutions will require government policies whose effectiveness is grounded in empirical evidence, and a public that understands the benefits that science can offer.

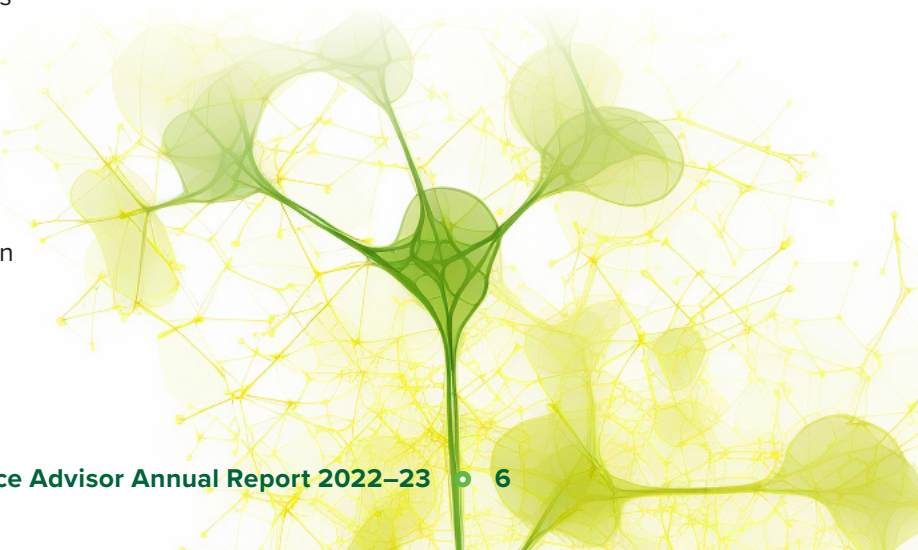
## The State of Canadian Science

Canada has an illustrious history of scientific innovation and achievement, from Banting and Best’s discovery of insulin to the development of the Canadarm for NASA’s space shuttle program. In the decades following World War II, Canada established itself as a global leader in scientific capability. Canadian scientists working abroad have also been the driving force behind world-changing technologies, from Nobel Laureate David Hubel’s mapping of the human brain’s visual cortex while at Harvard University to Shirley Tilghman’s groundbreaking research in molecular genetics at Princeton, where she served as President from 2001 to 2013.

Today, many of Canada’s postsecondary institutions, research institutes and federal government laboratories feature state-of-the-art research infrastructure. Within the federal government itself, total expenditures on scientific research and development totaled more than \$15.5 billion in 2022-23, over 80% of which was concentrated in 16 departments and agencies (see Appendix A). Canada has emerged in recent years as a global leader in cutting-edge technologies such as artificial intelligence and quantum science and technologies, with Canadian scientists among the top experts in these fields. Broadly speaking, Canadian scientists continue to rank among the most prolific in the world in terms of their publication of peer-reviewed research.

These successes have nevertheless taken place against a backdrop of increased global competition. Countries such as Brazil, China and India have more than doubled their research output since 2010, while other nations such as Australia, Italy, South Korea and Spain have made substantial gains. Space exploration is another indicator of heightened competitiveness, as China, India, Israel, Japan and Russia have all joined a renewed race to the surface of the moon, alongside the United States and its allies, including Canada.

Moving forward, Canada will need to re-assess its commitment to science and research in light of this increased competition. Though we continue to reap the benefits of prior investment, Canada lags its main G7 and OECD (Organisation for Economic Co-operation and Development) peers in terms of investment in scientific research and development, which is an indicator of innovation capacity and economic prosperity. Canada will need to modernize its research funding ecosystem to ensure it can support the rapidly evolving landscape in the 21st century.



## The role of the OCSA

Since its inception, and throughout the course of the past year, the OCSA has worked to amplify the place of science within the federal government, and to amplify Canada's status as a global scientific leader, notably for the betterment of:

- **Governance:** The OCSA works to ensure that federal decision makers can access best-in-class scientific advice on a timely basis, from scientists within and outside the federal government.
- **Excellence:** The OCSA supports research excellence in Canada.
- **Prosperity:** The OCSA promotes Canada's scientific capabilities as a pillar of its domestic economy and an asset in its international relationships.
- **Society:** The OCSA engages Canadians on scientific issues and on the value of science and the role it has played in Canada's history, culture, and identity — while encouraging more Canadians from all backgrounds to play a role in Canada's scientific community.

As this annual report details, through its work the OCSA strives to build a Canadian consensus on the importance of science to Canada's national prosperity and its international standing.

*The Chief Science Advisor attended the Conference of Montreal in August 2022 with François-Philippe Champagne, Minister of Innovation, Science and Industry, where she met with decision makers to discuss the role of science in building a sustainable and innovative future.*





PART 1

# Science Advice



The central pillar of the OCSA's mandate is to improve the provision of science advice to government. The fulfillment of this mandate — **that is, to amplify the role of science for the benefit of government** — takes two key forms:

- Offering recommendations to **enhance the provision of science advice** to decision-makers from within government, as well as establishing flexible frameworks that allow for the creation of temporary or ad hoc advisory bodies to convene scientific expertise from within and outside government for a specific purpose.
- Undertaking **research, reviewing evidence and producing reports on specific topics**, whether at the request of the government or as a proactive approach to emerging scientific matters.

The OCSA has been active on each of these fronts in 2022-23.

## Structures and Frameworks for Science Advice

### The Departmental Science Advisors Network

The Departmental Science Advisors Network, first established by the OCSA in 2018, had its most active year to date in 2022-23.

A total of nine federal science-based departments and agencies (SBDAs) have a departmental science advisor (DSA) whose role is to champion scientific excellence in departmental research; provide advice to senior management on key scientific issues; and promote dialogue between department scientists and academia (see Appendix B). The OCSA convenes the DSAs on a monthly basis to examine key issues from a multidisciplinary perspective, establishing a cross-departmental DSA Network that can make active contributions in support of government priorities and horizontal, cross-departmental science files. The DSA Network's advantages include:

- Breaking down departmental silos in scientific research.
- Establishing a broader community of interest and support among federal scientists.
- Enhancing cross-departmental and cross-sector scientific collaboration.
- Advancing the profile and prominence of scientific perspectives across government.
- Creating more robust pathways for science advice to decision-makers.

*In September 2022, the Departmental Science Advisors network met to discuss their priorities for the coming year and met with John Knubley, former Deputy Minister of Innovation, Science and Economic Development.*

As it has matured over its five-year existence, the DSA Network has evolved into an essential resource for the Chief Science Advisor, government decision-makers, and the federal scientific community. In 2022-23, the DSA Network assisted on a number of key government initiatives, including the:

- [Climate Science 2050 Plan](#)
- [2030 Emissions Reductions Plan](#)
- [OCSA Report on Post-Covid-19 Condition](#)
- Framework for science advice in emergency preparedness

DSAs have also become key contributors to Canadian scientific delegations abroad, such as the American Association for the Advancement of Science, the United Nations' Conference of the Parties on Climate Change (COP27), and the Conference of the Parties on Biodiversity (COP15). The DSAs' participation in international talks allows the federal government to buttress its contributions to these high-priority international collaborations.



## DSA Network: A Sampling of Departmental Initiatives from 2022-23

In addition to their group engagements, Departmental Science Advisors play leadership roles within their respective departments, driving key internal initiatives and speaking at national and international conferences. Among the highlights of their work this past year:

### Transport Canada

Departmental Science Advisor:  
**Dr. Gordon Lovegrove**

At Transport Canada, Dr. Lovegrove advised on establishing several research, development, and deployment plans in rail research, rail safety, and the transportation of dangerous goods.

Dr. Lovegrove also co-chaired Environment and Climate Change Canada's "Science Roundtable for Resilient Communities and Built Environments" and contributed to the critical review of the National Climate Science and Knowledge Plan, which will be pivotal in informing and advancing Canada's climate change mitigation and adaptation efforts.



### Fisheries and Oceans Canada

Departmental Science Advisor:  
**Dr. Paul Snelgrove**

As chair of the Canadian Science Advisory Secretariat, the primary vehicle for science policy advice at Fisheries & Oceans, Dr. Snelgrove has met with the Minister and Deputy Minister to advance open science and open data principles in the department. Dr. Snelgrove was especially active in issues related to career development for young scientists and career advancement for federal government scientists. He gave a keynote address at the ICES/PICES Early Career Conference on ocean research, and participated in a career advice panel with students and postdocs. He also engaged with DFO leadership in considering career advancement opportunities for scientists and the associated processes. Dr. Snelgrove also presented at multiple conferences including the All Atlantic Ocean Research and Innovation Alliance in Washington and COP15 in Montreal.



### Natural Resources Canada

Departmental Science Advisor:  
**Dr. Marc Saner**

Dr. Saner's efforts focused on promoting research collaboration. Working with NRCan's Directors General, Dr. Saner launched the Domestic Collaborations Landscape pilot project, which maps collaborations and significant connections between NRCan and academia. This information will be useful to identify external opportunities to strengthen existing collaborations and expand the collaboration landscape into such areas as industry, community organizations, Indigenous groups and international stakeholders.



## Health Canada

Departmental Science Advisor:  
**Dr. Cara Tannenbaum**



Dr. Tannenbaum upgraded Health Canada's Framework for Science and Research Excellence and introduced new science competency and leadership development initiatives, including a new Strengthening Science-Informed Decision-Making course as well as a French language training for scientists program. Dr. Tannenbaum also drove the launch of Health Canada's mandatory questionnaire to monitor the inclusion of disaggregated data on age, sex and race in clinical drug submissions. She also presented at the G20 Chief Science Advisors Roundtable in India on Canadian initiatives including One Health, Open Science, Diversity and Inclusion, and Coordinated Mechanisms for Science Advice.

## Public Health Agency of Canada

Departmental Science Advisor:  
**Dr. Sarah Viehbeck**



Dr. Viehbeck led consultations with partners and stakeholders on the Chief Public Health Officer's [Annual Report](#), which focused on climate change impacts to public health, and produced a companion report of [research priorities](#) to address knowledge gaps. These priorities then became the focus of a new Catalyst Grant launched by the [Canadian Institutes of Health Research](#). Dr. Viehbeck also partnered with Chief Public Health Officer Dr. Teresa Tam to convene an expert panel on mpox, which enabled real-time information sharing, facilitated research collaborations, and helped shape public health guidance.

## Environment and Climate Change Canada

Departmental Science Advisor:  
**Dr. Shawn Marshall (outgoing), Dr. Jennifer Winter**



In 2022-23, Environment and Climate Change Canada initiated work on a new departmental science strategy, advised by Dr. Winter as incoming DSA. The outgoing DSA, Dr. Marshall, was active in supporting Canada's commitment to the Kunming-Montreal Global Biodiversity Framework, assessing and summarizing the science and information required to for implementation. Both DSAs chaired ECCC's successful Science Cafés, a series of virtual presentations and informal discussions highlighting the department's cutting edge science and research programs.

## Expert Panel on Covid-19

In February of 2020, as the covid-19 pandemic was only just beginning to take shape, the Chief Science Advisor sought to establish a pathway that could quickly integrate external scientific perspectives on the emerging pandemic into federal decision-making.

To do so, the OCSA convened its Expert Panel on covid-19, a group of more than 20 distinguished researchers and practitioners from a broad range of disciplines, including infectious disease research and treatment, disease modeling, and the behavioural sciences, from across Canada. In both structure and process, the Expert Panel on covid-19 has provided a successful proof of concept, and a model that will be used for future issues as they arise.

The Expert Panel has met regularly since its creation, with its composition changing over time as knowledge of the disease evolved; its meeting schedule moved to an ad-hoc basis in 2022-23. During the course of its existence, the Expert Panel provided scientific advice on virus spread and containment, medical countermeasures and evolving immunity. Additionally, the panel members authored five public reports on emerging issues related to the pandemic, while providing input and guidance to numerous others.

Broadly speaking, the Panel served its role well as a channel through which the latest scientific developments surrounding covid-19, both in research and in clinical practice, could help inform public policy. The Panel's meeting summaries, compiled and distributed to ministers and decision makers, often shaped the course of key policy decisions.

The OCSA expects to wind down the work of the Expert Panel on covid-19 by the end of 2023, thus bringing a highly successful and useful initiative to a close. The Expert Panel has demonstrated the willingness of top scientists to dedicate their time to assist government; the ability of the OCSA to identify and assemble key experts swiftly; and the importance of maintaining flexible structures so that panels can grow, evolve, or wind down as circumstances change.

The Panel is expected to provide a formal report on lessons learned and recommendations for improvement by the 2023-24 year-end



## Long COVID Task Force

In July 2022, with mounting evidence of lingering effects of covid-19 lasting weeks beyond initial recovery from acute infection, the Chief Science Advisor brought together 16 experts from government, academia and clinical practice to form the OCSA [Task Force on Post-Covid-19 Condition](#) (the condition also known as “long covid”). The purpose of the long covid task force was to provide government with the latest scientific evidence and advice on post-infection illness and its health and societal impacts.

In its initial meetings, the Task Force quickly identified the key subject areas related to long covid to be examined. The Task Force then invited subject matter experts to participate in roundtable discussions on:

- Clinical research and practice — to inform prevention and treatment options
- Pathogenic and mechanistic pathways — to understand the causes of the illness and develop effective treatment
- Socio-economic impacts — to evaluate impacts on the community and labour markets, and to address gaps
- Health system impacts — to anticipate and address eventual pressures on the system
- Lived experience of long covid — to hear directly from individuals suffering from long covid and ensure people-centred solutions
- International approaches — to learn from the experience of other jurisdictions and adopt best practices

The [roundtable discussions](#) took place between July 21 and October 7, 2022. From their findings, the Task Force developed a three-point framework for action, including 18 recommendations. The roundtable discussions, framework and recommendations were collected into a [final report](#), published in December 2022, entitled *Post-Covid-19 Condition in Canada: What We Know, What We Don't Know and a Framework for Action*. The report and its findings were welcomed by Health Minister Jean-Yves Duclos and other government agencies, and received broad coverage in print and broadcast media.

This experience demonstrates the OCSA's maturing capacities and capabilities: this Office was able to assemble a task force on a pressing and still-evolving public issue, conduct in-depth research reviews, host multiple task forces with invited subject matter experts, collect and collate data and information, develop action plans and recommendations to government, and issue both a preliminary and a final report addressing a complex matter — all in less than six months.

*In December 2022, Dr. Nemer delivered her recommendations on long covid to Health Minister Jean-Yves Duclos.*



# Collaborations, Research Projects and Reports

## Emergency Preparedness

In the wake of the OCSA's contributions to the federal government's covid-19 response, both through its Expert Panel and other initiatives, the Chief Science Advisor has been invited to participate in a number of review and planning exercises on emergency preparedness and response.

- In 2022-23 the OCSA took part in a number of planning discussions involving Public Safety Canada and the Privy Council Office's Emergency Preparedness Secretariat, to explore best ways to include science in all aspects of emergency response and to formalize the OCSA's role in emergency response.
- The OCSA served as an observer for a Canadian emergency response exercise as a platform for establishing the use of science advice in emergencies within the federal public service.
- The OCSA initiated a joint simulation exercise between Canada and the United States for a cross-border emergency. Preparations took place late in the 2022-23 year, with the simulation itself scheduled to take place in 2023.
- In March 2023, Health Canada, in collaboration with OCSA, announced its own formal Review of the Federal Approach to Pandemic Science Advice and Research Coordination.



*In July 2022, the Chief Science Advisor hosted a meeting with the Chief Scientist and other representatives of the U.S. Department of Homeland Security to discuss the coordination of science in emergency preparedness and response.*



*The Chief Science Advisor met with Minister Bill Blair to discuss the role of science in emergency preparedness.*

## Report on the Federal Science Workforce

The mandate of the Chief Science Advisor includes the responsibility to report on the state of the federal science workforce. The federal government employs more than 31,000 scientists and researchers across more than 40 departments and agencies, which are substantial investments in both human resources and research. This particular subset of the federal workforce not only conducts essential and often groundbreaking research; it also has the potential to act as scientific “surge capacity” in times of emergency. The federal government needs to understand the characteristics and the importance of its science workforce in order to deploy it fully, and for it to effectively fulfill its role as a vital player in the national innovation ecosystem.

Currently, no single institution or agency holds responsibility for systematically collecting data on this significant segment of the federal public service. A variety of institutional sources, including Statistics Canada and the Treasury Board Secretariat, each collect some data that can provide limited windows of insight. But they do not combine to paint a full picture of this workforce — their disciplinary, cultural, and demographic diversity, for instance, or their fields of study and education level — or the issues at stake in their work, such as opportunities for research collaboration or career advancement, and the roles they play within their respective departments. (In fact, most sources use a different definition of “scientist.”) As a result, this particular dimension of the OCSA’s mandate has been challenging to execute.

Working with existing sources of data, in the past year the OCSA set about collecting and standardizing the most comprehensive database yet on this group. The OCSA also reviewed previous reports and recommendations on the federal science workforce, with a view towards providing an evidence-based portrait of where that workforce currently stands.

The OCSA’s inaugural Report on the Federal Science Workforce will be published by the end of 2023, providing the most comprehensive overview to date of this segment of the federal public service. Following that initial publication the OCSA will produce complementary reports addressing specific themes, working in collaboration with Statistics Canada, the Treasury Board Secretariat and other key players within science-based departments and agencies.



*Roughly 31 000 federal employees work in RandD and other scientific-related activities across Canada. Pictured here is the Agriculture and Agri-Food Canada laboratory in Saskatchewan.*

## Sky Canada Project

Following recent calls for increased government transparency on the subject of unidentified aerial phenomena (UAPs, sometimes referred to as UFOs), the OCSA launched the Sky Canada project in the fall of 2022 to study how UAP reports from the public are managed in Canada and to make recommendations for improvement.

Until approximately 1995, public reports of UAP sightings were referred to the National Research Council. Since the elimination of that function, there has been no centralized government resource for reporting UAP sightings, of which there are typically more than 700 per year in Canada. UAP sightings are of deep concern to those who witness them. Research from prior years and other countries shows that only about 3 per cent of sightings cannot be explained, but there is currently no authority in Canada tasked with collecting and investigating them. The absence of an investigative function for UAPs in Canada can lead to the proliferation of misinformation and conspiracy theories.

The Sky Canada Project is a timely undertaking given increased attention and transparency in other countries around the world. In the United States, for instance, NASA has commissioned an independent scientific study of UAPs while the Pentagon has established an All-Domain Anomaly Resolution Office. In France, the Groupe d'Études et d'Information sur les Phénomènes Aérospatiaux Non identifiés (GEIPAN) has taken up the task of collecting, analyzing, and archiving reports of UAP sightings, and informing the public of its findings. The OCSA intends to publish a final report on the Sky Canada project some time in 2024.

*In August 2022, Dr. Nemer visited the SNOLAB research facility near Sudbury, Ontario with Minister Champagne.*

## Ministerial Meetings, Parliamentary Committees, and Other Engagements

As part of her work on delivering science advice to government decision-makers, the Chief Science Advisor meets with cabinet ministers and other key members of government, appears before parliamentary committees, and engages broadly with stakeholders in the research and innovation ecosystem.

- In October 2022 Dr. Nemer appeared before the Advisory Panel on the Federal Research Support System, Chaired by Université de Montréal Dean of Arts and Sciences Frédéric Bouchard, to provide the OCSA's perspective on how to improve support for scientific research in Canada.
- Dr. Nemer also met twice during the year with the vice-presidents of research from the U15 Group of Canadian Research Universities to discuss the state of pure and applied research within their institutions, and to discuss common needs and issues.
- In August 2022 Dr. Nemer visited the SNOLab research facility near Sudbury, Ontario with François-Philippe Champagne, Minister of Innovation, Science and Industry, and Canada Foundation for Innovation CEO Roseann O'Reilly Runte. Minister Champagne announced \$102 million in funding for SNOLab's cutting-edge research into neutrino particles and dark matter. SNOLab, unique in the world for its capabilities due to its location more than 2 kilometres underground, is part of Canada's network of crucial major research facilities that bolster the country's global status as a leader in scientific research.
- Dr. Nemer appeared before the Standing Committee on Fisheries and Oceans in April 2022, in a productive exchange with committee members on the nature and practice of science advice.
- The OCSA convened a roundtable of experts on the issue of advanced materials manufacturing, which contributed to Public Safety Canada's list of sensitive technologies for the protection of national security.





# Amplifying Science Advice: Observations and Future Directions

Since its creation, the OCSA has worked to expand its ability to assist government decision-makers by establishing new channels for the swift provision of science advice. The OCSA has become a welcome and helpful collaborator to multiple government departments.

## International models for Canada

When the OCSA was created, many of Canada's allies and peer nations already had science advice functions in place within their governments. Around the world, the COVID-19 pandemic drove many governments to recognize the value of science advice as a horizontal function across government. Japan and France stand out as G7 partners who have taken steps to strengthen the science advice function within their bureaucracies.

Among Canada's peer nations, one of the most effective models for the provision of science advice — and perhaps the one best suited to Canada's parliamentary system of government — is found in the United Kingdom. The post of Chief Scientific Advisor was first created in 1964. In the decades since, the science advice function in the UK has matured into an embedded ecosystem that supports evidence-based policymaking across the whole of government.

Given its track record to date, the OCSA recommends a number of steps that would better anchor its role within the machinery of government. At this stage of its evolution, the OCSA would benefit from more formal and sustainable linkages with the activities of government where science advice is needed.

The UK model has in turn served as the basis for highly effective science advice ecosystems in Australia and New Zealand, with several key components:

- a network of departmental and regional science advisers,
- support from a government office for science,
- a separate parliamentary office for science and technology,
- an external advisory council co-chaired by the chief science advisor, and
- close working relationships with learned societies and academies.

A recent report, [Science Advice in the UK](#), provides an excellent, detailed overview of how the UK system functions. By extension, the report offers a blueprint for Canada in terms of better embedding a science advice ecosystem that supports the whole of government.



*In November 2022, Dr. Nemer spoke at the One Health G7 Research Summit about the importance of embracing the interdependence of environmental health and all species including humans.*



*Dr. Nemer met with her international counterparts at the G7 SandT Advisors' Roundtable hosted by the Japanese Embassy in Washington, D.C. The meeting saw productive discussions on science integrity, researcher mobility, and the values underlying international research collaborations.*

## Expanding the Departmental Science Advisors' Position in Government

When the OCSA first established the DSA Network, it did so based upon the UK example. In the absence of any legislation or regulations to support its creation or function, the OCSA set out to build the DSA Network through pure persuasion: making the case to departmental deputy ministers of the value such a network could bring to government.

The DSA Network was launched in 2018, with four government departments and agencies recruiting a Departmental Science Advisor to take part. Since then the Network has expanded to include nine DSAs. Importantly, the DSAs' value added to their home departments has become evident, as illustrated by those departments' systematic renewal of the position.

In several peer countries including the UK, the USA, Japan and New Zealand, departmental science advisors are prominent within ministries responsible for public safety, national defence, global affairs, agriculture, and industry, among others. Their expertise spans the entire range of scientific disciplines from the physical and engineering to the social and behavioural sciences. Given this common state of affairs among Canada's international allies, the OCSA is eager to have most of Canada's government departments and agencies nominate a Departmental Science Advisor and join this increasingly effective network.

PART 2

# Better Science

The OCSA's mandate specifically includes a responsibility to recommend ways for the federal government to better support quality scientific research within the federal system. The promotion of scientific excellence applies to research being funded by the federal government and conducted both within and beyond federal government departments and agencies. It spans how we build and maintain research infrastructure and tools, how we develop human talent, and how we conduct and mobilize science for the benefit of the population.

## Scientific Integrity Policy

Research integrity is a pillar of science excellence. In 2018, the OCSA drafted a [Model Policy on Scientific Integrity](#) that has since been adopted by all relevant federal departments and agencies. Key provisions of the Model Policy include:

- ensuring that scientific research within the federal system is consistent with the highest standards of excellence and is kept free from political, commercial, client or stakeholder interference.
- establishing researchers' and scientists' right to speak publicly about their work, and ensuring that federal government science and research are appropriately represented and communicated to the public.

In April 2022 the OCSA published a survey report entitled [The Status of Federal Scientific Integrity Policies](#), which found that 22 of 25 federal departments and agencies currently have a scientific integrity policy in effect; of the remaining three, one policy is pending approval while two remain in development. The report also surveyed departmental progress in implementing their policies, as some departments have had them in effect for more than two years.

Based in part on the results of the survey, the OCSA drafted Version 2.0 of the Model Policy, with provisions to address emerging issues such as Indigenous Knowledge, the use of generative artificial intelligence tools, research security, and open science.

The OCSA also followed through on a key priority noted in the *2021-22 Annual Report*: the development of a course, available through the Canada School of Public Service beginning in April 2023, to educate the federal workforce on issues surrounding scientific integrity. Entitled *Strengthening Evidence-Informed Government Decision-Making: A How-To Guide* (TRN502), the online self-paced course helps learners develop the skills and knowledge needed to understand when scientific evidence is relevant, and its appropriate role and use in decision-making.



*The science integrity governance committee met at the end of the year to evaluate progress on the implementation of the policy and to plan for the year ahead.*

# Roadmap for Open Science

In February 2020, the federal government, through the Minister of Innovation, Science and Industry, embraced the OCSA's proposed Roadmap for Open Science. The Roadmap leads to two key destinations:

- **Open Access:** The publications authored by federal scientists will be openly accessible.
- **Open Data:** The data collected and used by federal scientists in the course of their publishable research will reflect FAIR data principles (findable, accessible, interoperable and reusable).

The Roadmap provided a multi-year pathway for reaching these destinations. In 2022-23, important progress was realized with the creation of the Federal Open Science Repository of Canada (FOSRC) in collaboration with Shared Services Canada, the Federal Science Libraries Network, and eight science-based departments and agencies. The repository will house both published peer-reviewed articles by federal and federally funded researchers, as well as other scientific and technical reports from Government of Canada scientists.

The OCSA encourages a more ambitious stance on open access to publications resulting from federally funded research in Canada. It recommends making such publications open without embargo no later than December 2025, a commitment similar to the one taken by the United States White House Office of Science and Technology Policy.

# Critical Technologies

Canada is recognized as an advanced contributor to research in a number of cutting-edge fields, including artificial intelligence (AI), nuclear energy, biotechnology, advanced materials manufacturing, and quantum computing. Such technologies have the potential to be transformative, changing the way many other scientific endeavours are conducted. Leadership in these technologies can, in turn, provide Canada and its economy with competitive advantages in the future. In certain circumstances, these technologies also have national security implications. The OCSA believes it is important for Canada to maintain its position as a global leader among nations in these fields, by promoting research excellence in Canada's broader scientific community, and by encouraging robust discussion within government about future research directions and applications of critical technologies.

In 2022-23 the Chief Science Advisor convened an expert roundtable on advanced materials and manufacturing to better understand the sensitive and strategic nature of these technology domains. The roundtable opened up new engagements with the security and intelligence community in Canada, and provided opportunities for the Chief Science Advisor to provide science advice in research security decisions. Among other initiatives, the OCSA contributed to Public Safety Canada's consultations to develop a list of sensitive technologies.

The Chief Science Advisor is also a member of the Government of Canada Advisory Council on Artificial Intelligence, where the responsible development of generative AI and other AI applications is discussed.

The OCSA intends to continue its contributions to government discussions on critical technologies, in part by convening experts from outside government to support government decisions in these areas.

## Open Science, Critical Technologies, and Research Security

At first glance, Canada's commitments to both open science and research security can appear paradoxical. But research security is not equal to "closed" research, although some critical and sensitive technologies do have implications for national security and demand robust protections. Research security is about securing research data and methodology, and goes hand in hand with open science. It is essential for the integrity of science, which is why the promotion of best practices for "research security hygiene" is in everyone's best interest.

## Impact Assessment Science

When proposed public-sector or private-sector projects undergo an assessment of their environmental, health, economic and social impacts under the 2019 federal Impact Assessment Act, they are evaluated based in large part upon scientific evidence brought forward by its proponents. Hence, the ability of adjudicators to understand and appraise that scientific evidence is crucial to any assessment's outcome, and encourages project developers to establish high standards for their own research.

The OCSA in 2021 developed a Science Review Tool (SRT) to help evaluate the integrity, credibility and transparency of science submitted by project proponents. In 2022, following a number of SRT trial applications, OCSA staff drafted a federal authority version of the SRT which also takes into account the legal, policy and logistical constraints under which federal officials conduct their work. The OCSA is currently revising the federal authority version of the SRT based upon feedback drawn from workshops held in summer 2022.

# Amplifying Research Excellence: Observations and Future Directions

For the past five years, the OCSA has endeavoured to promote research excellence across the federal government and throughout Canada's scientific community. Some of that work is ongoing and has been described in successive annual reports.

In the past, the OCSA has also reported on specific, defined initiatives and provided recommendations to government as a third-party observer, such as on the need for a quantum technology roadmap for advancement (2020-21) and the review of federal laboratory facilities (2019-20).

In 2019-20, the OCSA reported to government on the state of the country's major research facilities, ranging from the TRIUMF particle accelerator to the CCGS Amundsen research icebreaker, and made recommendations to ensure better long-term planning and sustainability of these critical infrastructures. All of these recommendations remain relevant.



*The CCGS Amundsen icebreaker is one of Canada's major research facilities. It supports multidisciplinary research programs addressing some of the most pressing challenges of our time.  
[Credit: Canadian Coast Guard]*

## The Need for a National Science and Technology Strategy

In the last six years, the Government of Canada has released two reports on the state of federal support for scientific research. The first, *Investing In Canada's Future: Strengthening the Foundations of Scientific Research*, was published in 2017. The second, *the Report of the Advisory Panel on the Federal Research Support System*, was published in early 2023.

Both reports recommended the creation of a body to develop goals and priorities for research and innovation, and to improve the coordination and strategic alignment of federal support. The 2017 report proposed the creation of a National Advisory Council on Research and Innovation; the 2023 report similarly recommended the creation of a Canadian knowledge and science foundation.

From this office's work and interactions with members of Canada's broader scientific community, as well as with international peers, there is a need for a national science and technology strategy. A strategy could establish a clear vision for Canada's continued leadership in key domains of research and innovation. This, in turn, would assist in prioritizing investments and, crucially, in attracting and developing the talent Canada needs to help secure its global position and future prosperity.

The strategy could be developed following broad consultations with Canada's research and innovation communities. The Chief Science Advisor thus recommends working with a high-level advisory group to produce an updated science, technology and innovation strategy for the government's consideration. The OCSA will offer its assistance in developing such a body, structuring its consultations and authoring its proposals.

PART 3

# Science Diplomacy



The OCSA's mandate includes the promotion of Canadian science and research abroad. Science, technology and innovation (STI) are often a foundational component of international trade, and scientific cooperation accelerates discovery and promotes diplomatic relations. International engagement provides opportunities for the Chief Science Advisor to buttress Canada's relations with allies, advance the state of Canadian scientific knowledge, and open up new economic opportunities for Canadian innovation and commercialization. Science diplomacy can also facilitate bridge building and conflict resolution by bringing forward shared interests and calling upon the human relationships developed over many years.

## Working with STI Partner Nations

Many of Canada's global allies are also its most prominent collaborators in science, technology and innovation. The Chief Science Advisor's meetings with international government representatives, her participation in government-led bilateral and multilateral committees and gatherings, and her leadership of Canadian delegations at international conferences, all contribute to Canada's ongoing healthy relations with key partners around the world.

*In June 2022, Dr. Nemer attended the G7 Science Ministerial in Frankfurt. Discussions focused on promoting open, collaborative and inclusive science for solving global challenges.*



## New Canada-France Joint Committee on Science, Technology and Innovation

This year, the Chief Science Advisor, alongside colleagues from Global Affairs Canada, successfully led Canada's effort to establish a new **Canada-France Joint Committee on Science, Technology and Innovation**.

The joint committee, Canada's first with a francophone nation, brings the total number of Canada's joint committees to 16, a list that includes Brazil, the European Union, India, Japan and the United Kingdom. Joint committees typically meet every 18 to 24 months to discuss current and future areas of scientific collaboration across government, academia and the private sector. They often serve as a vehicle for connecting scientists and researchers to one another and to research funding, and allow the participating nations to partner on strategic innovation and research.

Dr. Nemer will co-chair the committee with Dr. Claire Giry, the Director General of Research and Innovation with France's Ministry of Higher Education and Research. The committee's initial focus will be in the priority areas of quantum science and artificial intelligence. To facilitate collaboration, the Natural Sciences and Engineering Research Council of Canada (NSERC) and France's Agence Nationale de Recherche announced a partnership to fund joint research projects in these areas.

## Promoting Francophone Science

English is presently the predominant language of international scientific exchange and publication, but people of all languages need to be able to communicate about science and engage in research in their mother tongue. Science is a lens through which we not only understand the world around us, but also shape that world and the neighborhoods and communities we live in, from infrastructure, buildings and machines to manufacturing and communication systems, not to mention every electronic device used in our homes and workplaces.

Dr. Nemer has provided recommendations for promoting the use of French in science to the parliamentary Standing Committee on Science and Research.

As part of the Canada-France priorities for 2024, the OCSA will co-host a bilateral roundtable on French, plurilingualism and science, aimed at providing practical options for making science and research outputs available in French.



*Dr. Nemer spoke at the Acfas virtual colloquium in May 2022 to discuss the importance of open science and the use of French language in research and science.*

Dr. Nemer and Quebec Chief Scientist Rémi Quirion were instrumental in the creation of the Francophone Network of the International Network for Government Science Advice (INGSA), the pre-eminent international association of science advisers. INGSA's Francophone Network, based in Quebec City, will support the practice of science advice in French-speaking countries around the world.



*Dr. Nemer joined her colleague Rémi Quirion, Chief Scientist of Quebec and President of the International Network for Governmental Science Advice (INGSA), to launch the INGSA Francophone Network*

## Canada-US Engagements

The United States is Canada's largest trading partner and its most important collaborator in scientific research and innovation. Although Canada and the United States do not maintain a joint committee on STI, many well-established pathways exist between Canadian and American firms and institutions to facilitate joint projects, the result of decades of close cooperation.

In this environment, the Chief Science Advisor works to develop, maintain and expand a wide range of cross-border relationships with American officials, often through department-specific bilateral meetings, to discuss and advance shared priorities.

This past year, Dr. Nemer hosted **NASA** Chief Scientist Dr. Katherine Calvin in June 2022, and in July hosted Dr. Sam Howerton, Chief Scientist with the **Department of Homeland Security**; the OCSA then hosted a DHS delegation in December to discuss issues of research security and emergency preparedness.

In March 2023, Dr. Nemer met with her newly appointed counterpart in Washington, D.C., Dr. Arati Prabhakar. As Director of the **White House Office of Science and Technology Policy**, Dr. Prabhakar holds a cabinet-level position and is a direct advisor to the US president.

The OCSA also partnered bilaterally with the **United States Global Change Research Program** (USGCRP) to assist in its creation of a National Nature Assessment. Scheduled for release in 2026, the assessment will take stock of U.S. lands, waters and wildlife, and the benefits they provide to Americans' economy, health, climate, environmental justice and national security. The USGCRP called upon the OCSA to provide its perspective on the National Nature Assessment's scope, objectives and methodology.



*In March 2023, Dr. Nemer met with her counterpart in Washington, D.C., Dr. Arati Prabhakar.*

## Dr. Mona Nemer Delivers the 2022 Bromley Memorial Lecture

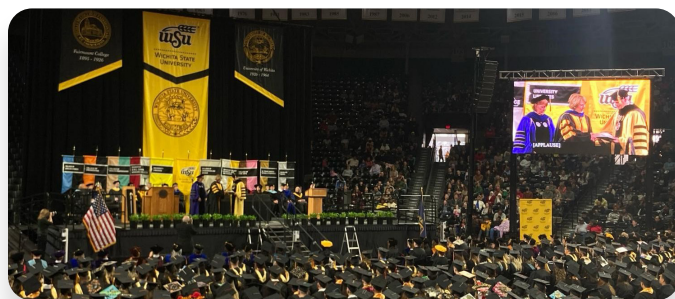
In April, the Chief Science Advisor delivered the keynote address at 2022's Bromley Memorial Event, held at the University of Ottawa.

This annual event is jointly organized by the University of Ottawa's Institute for Science, Society and Policy and George Washington University's International Institute for Science and Technology Policy. It is named for D. Allan Bromley, the Canadian-born, world-renowned nuclear physicist who was the first person to hold the cabinet-level rank as Assistant to the President for Science and Technology, from 1989 to 1993.

In her address, *The Complex Role of Science Advice in Informing Policy*, Dr. Nemer spoke of the lessons learned from the covid-19 pandemic and the appropriate role of science advice in policymaking alongside legal, social and economic considerations, while preserving the rights of citizens.



*Dr. Nemer held an audience question and answer session following her Bromley Memorial Lecture on the complex role of science advice in policy making.*



*In December 2022, Dr. Nemer received an honorary doctorate from her alma mater, Wichita State University.*

# Science Among Nations: Multilateral Meetings and Initiatives

Canada is deeply committed to multilateral organizations such as the G7 Group of Nations, the United Nations, the Organization for Economic Cooperation and Development, and many others. And, in a changing world marked by increased diplomatic and military tensions, the lingering impacts of the COVID-19 pandemic and intensifying climate events, those multilateral organizations have increasingly prioritized the importance of scientific collaboration in the search for solutions. In 2022-23, multilateral discussions centred around four specific themes:

- 1. Open Science and Research Security**, balancing the desire to encourage discovery and knowledge creation with the need to secure the integrity of data and to assess the security implications of research.
- 2. Emergency Preparedness and Management**, recognizing that international scientific cooperation can help manage future pandemics and other adverse events.
- 3. Climate Change and Biodiversity Loss**, and the search for solutions at the local and global scale.
- 4. Combating Misinformation**, by promoting knowledge transfer from international research on science denial, information manipulation, and disinformation in the practice of science communication.

## The G7 Group of Nations

The Chief Science Advisor attended the Frankfurt G7 Science Ministers Meeting in June, one of many ministerial meetings leading to the G7 First Ministers meeting in the fall. At the request of François-Philippe Champagne, Canada's Minister of Innovation, Science and Industry, Dr. Nemer served as Canada's ministerial envoy to the meeting.

At those meetings the G7 Science Ministers reaffirmed their commitment to open science, praising the work of both its Open Science and Security and Integrity Working Groups, and planned to consider the creation of a Working Group on scientific misinformation. The Ministers also pledged to promote research on carbon dioxide capture technologies, the ocean-climate-biodiversity nexus, and post-COVID-19 condition.

## The Role of STI in International Trade: A Look at Canada's Indo-Pacific Strategy

In November 2022, Global Affairs Canada released its new Indo-Pacific Strategy for engagement in the region in the decade to come. The strategy, which focuses on India, Japan, South Korea and the member states of the Association of South East Asian Nations (ASEAN), entails investments of nearly \$2.3 billion over five years, including a wide range of initiatives related to science, technology and innovation (STI). The strategy includes:

- Efforts to develop digital infrastructure with Indo-Pacific partners to facilitate common standards and interoperability.
- Plans to expand natural resource and cleantech ties in the region related to trade, investment, and technological capabilities.
- Funds to support international STI partnerships, including commercialization-oriented research, allowing Canadian small and medium-sized enterprises to develop new high tech products and services, a total five-year investment of \$65.1 million.
- Commitments to bolster visa processing for applicants from the Indo-Pacific, including a \$14.2 million increase in investment for the Scholarships and Educational Exchanges for Development (SEED) program with countries in the region.
- Measures to protect Canadian post-secondary institutions from malign actors.
- Investments to protect Canada's innovation and knowledge economy from intellectual property theft.

The Indo-Pacific Strategy shines a light on the role science plays in Canada's international relations, and provides a model on how to use Canada's research and scientific capabilities as a platform for increased international cooperation that is mutually beneficial.

## International Cooperation on Climate and Nature

Climate change does not abide by national boundaries. Even as individual nations take steps to mitigate against the effects of climate change, international scientific cooperation will be needed to implement lasting solutions, whether in the realm of clean energy and energy transition, low-carbon manufacturing, carbon capture, or impacts on biodiversity and wildlife habitat. Throughout 2022-23 the Chief Science Advisor and the OCSA were deeply engaged in international efforts on all these issues.

- The Chief Science Advisor attended the United Nations' **27th Conference of the Parties to the Framework Convention on Climate Change** (commonly known as COP 27) in November 2022. As part of the proceedings, the OCSA organized a panel of international science advisors entitled Science Advice for a Successful Energy Transition.
- The OCSA also participated in the United Nations **15th Conference of the Parties to the Convention on Biological Diversity** (COP15), held in Montreal December 2022. The Chief Science Advisor was the lead author of the COP15 International Science Advisors Statement, calling for immediate and coordinated action to preserve biodiversity, signed by top-ranking science advisors from 26 countries, as well as the President of the International Science Council.
- The OCSA also represented the federal government at the 34th meeting of the Parties to the **United Nations Environment Programme's Montreal Protocol on Ozone Depleting Substances** (MOP34). The Chief Science Advisor moderated a high-level roundtable of government and industry representatives on the Montreal Protocol's Kigali Amendment and its potential climate impacts. Under the Kigali Amendment, signed in 1996, signatories agreed to reduce hydrofluorocarbon manufacturing by 80 percent over 30 years.

In every engagement, the Chief Science Advisor advocated for science and technology to play an end-to-end role in the effort to find solutions to these challenges. For science to make optimal contributions, scientists and researchers need to be included in diagnosing problems, designing the strategies and frameworks for implementation, and assessing their progress.



*At the 5th Science Policy Forum at COP15, the Chief Science Advisor was the lead author of the International Science Advisors Statement calling for immediate action on biodiversity preservation.*



*Dr. Nemer spoke at the 34th Meeting of the Parties to the Montreal Protocol about the possibilities of mitigating the effects of climate change following the implementation of the Kigali Amendment.*

## Disaster Risk Reduction in the Americas and the Caribbean

In March 2023, the Chief Science Advisor traveled to Uruguay as part of Canada’s delegation to the eighth **Regional Platform for Disaster Risk Reduction** in the Americas and the Caribbean. Organized by the [United Nations Office for Disaster Risk Reduction](#), the Regional Platform’s theme for this meeting was “Science and Technology for the Comprehensive Management of Disaster Risk.”

Dr. Nemer spoke on [the role of science and technology in integrated disaster risk management and climate change adaptation](#), from preparedness, to mitigation, response and recovery. She also spoke about the participation and advancement of women and girls in STEM fields.

The Canadian delegation was led by Public Safety Canada, which the OCSA supported throughout the year on its mandate to incorporate the use of science across all elements of emergency preparedness. The gathering concluded with the release of a Science and Technology Declaration calling for, in particular, the application of open data principles to disaster research, as well as improved access to “big data” and remote sensing data in ways that can reduce disaster risk and support recovery and relief efforts.



*Dr. Nemer was part of Canada’s delegation to the eighth Regional Platform for Disaster Risk Reduction in the Americas and the Caribbean, and spoke on the role of science and technology in managing disaster risk.*

## The 100 Days Mission for Pandemic Preparedness

Working with the UK-based International Pandemic Preparedness Secretariat (IPPS), the OCSA continued its support for the development and implementation of the 100 Days Mission to ensure the swift development and distribution of effective diagnostics, therapeutics and vaccines in the event of future pandemic threats.

Led by Sir Patrick Vallance, the former Chief Science Advisor of the United Kingdom, the 100 Days Mission is an “Apollo” style coordinated effort to ensure that future pandemic threats will be met with a coordinated, science-driven international response. The 100 Days Mission is supported by a broad coalition of countries including the G7 and G20. The IPPS is a time-limited entity whose objective is to complete the 100 Days Mission by 2026. The IPPS reports annually to the public on its efforts and its progress. The Second Implementation Report of the 100 Days Mission was released in January 2023.

# Representing Canadian Science Abroad

In addition to engaging with government representatives, the Chief Science Advisor also represents Canada abroad at conferences and other engagements organized by various national and international science organizations. For the OCSA, these activities are in effect science missions, allowing Canada to shore up its STI assets abroad, encourage partnerships, and attract talent.

## The American Association for the Advancement of Science

In March 2023, the Chief Science Advisor led a “Team Canada” delegation of 70 representatives to the annual conference of the American Association for the Advancement of Science, held this year in Washington, DC. The AAAS annual conference is the largest of its kind in the world, an unequalled opportunity to showcase Canadian capabilities and spark new international collaborations. This year more than 4,500 scientists, researchers, policymakers and journalists were in attendance.

The Canada Pavilion at the AAAS served as a magnet for activity during the conference, hosting a number of well-attended speaking events. Dr. Nemer hosted a discussion with Quebec Chief Scientist Rémy Quirion and moderated a panel showcasing Canada’s strengths, priorities, investments and international collaborations.

Members of the Canadian delegation also held meetings with representatives from the National Academies of Sciences, Engineering and Medicine (NAS), the National Science Foundation (NSF), the National Institutes of Health (NIH), the US Department of State, and the White House Office of Science and Technology Policy (OSTP). The many relationships forged and deepened at the AAAS conference can help pave the way for future Canada-US STI partnerships.

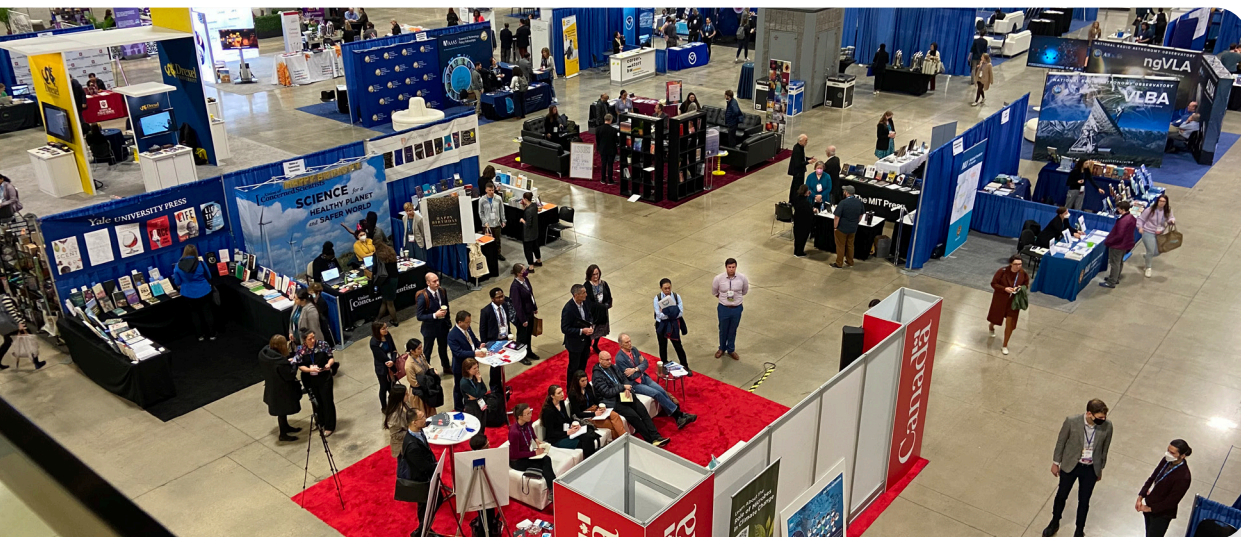
## International Speaking Engagements

The Chief Science Advisor is a sought-after speaker at scientific conferences around the world. Her speeches and talks emphasize the value of science advice in policymaking, the importance of diversity and inclusion in science, and Canada’s cutting-edge scientific capabilities.

- The Chief Science Advisor was a keynote speaker at the **United Nations Science Summit** in September 2022, held as part of the 77th UN General Assembly. Her speech focused on how growing science advisory systems will help to both frame the emerging issues facing the world and provide the evidence and analysis needed to solve them.
- Dr. Nemer was a featured speaker via Zoom at the **Science Advice Under Pressure** conference held in Brussels in April 2022, organized by the European Commission Group of Chief Scientific Advisors and the Science Advice for Policy by European Academies Consortium.
- In September 2022, the Chief Science Advisor was the keynote speaker at a virtual conference attended by representatives from Canada and the Nordic countries on **Canada Nordic STI Cooperation**.
- Dr. Nemer participated in a **Switzerland-Canada panel on science diplomacy** and spoke to a gathering of the **German National Academy of Sciences**.



*In June 2022, the Chief Science Advisor took part in a Switzerland-Canada panel discussion on science diplomacy.*



*The Chief Science Advisor led a delegation of Canada's science community to the 2023 AAAS conference in Washington, D.C. The Canada booth was a focal point for promoting Canadian science and research collaborations on the international stage.*

## Amplifying Canadian Science Abroad: Observations and Future Directions

On the international scene, science advice is playing a more prominent and more complex role than ever before. Nations that did not until recently have a science advice function have moved quickly to implement one, many of them spurred to do so at the onset of the covid-19 pandemic. Associations dedicated to science advice are helping them share best practices.

Research and innovation are also playing a more prominent role internationally. Canada's science, technology and innovation (STI) capabilities help to encourage research collaboration, as well as commercialization and trade. Canada's Indo-Pacific Strategy (see above) is a case in point: The strategy not only targets key economic sectors where science plays a prominent role, it treats STI as a sector in its own right.

### An International Science Strategy

As the importance of STI capabilities increases in international relations, any future national science and technology strategy for Canada (see Section 2: Better Science) should include an international dimension. Both the United Kingdom and Germany have developed international science strategies; the US Department of State has an Office of Science and Technology Cooperation that features, among other initiatives, a Science Envoy Program in which eminent US scientists and engineers serve for a year overseas to strengthen bilateral science and technology relationships.

The elements of an international STI strategy for Canada could include the creation of embassy science attachés to complement the work of trade commissioners, and a science diplomacy fellowship program for short-term secondments to Global Affairs Canada, including at headquarters and overseas missions, for prominent and promising Canadian scientists.



PART 4

# Science Champion

The Office the Chief Science Advisor holds a mandate to promote dialogue between federal scientists and academia in Canada, and to raise awareness of scientific issues relevant to the Canadian public. As in prior years, the OCSA has interpreted these aspects of its mandate broadly, as part of a broader effort to **amplify the role of science for Canadian society**.

In her role as a champion of science, the Chief Science Advisor often serves as a cultural ambassador for science with different segments of the Canadian public. Dr. Nemer uses her role, her voice and her office to encourage more participation in the sciences, elevate the voices of others, debunk myths, and demonstrate the value of science in Canadians' everyday lives.

## Indigenous Perspectives in Science

The issue of Indigenous peoples' participation in science, technology and research is more than a matter of representation. As Laurentian University Adjunct Professor of Biology Jesse Popp has written, "Science is the pursuit of knowledge. Approaches to gathering that knowledge are culturally relative. Indigenous science incorporates traditional knowledge and Indigenous perspectives." As a result of their cultural heritage and upbringing, Indigenous scientists often approach research problems differently. Their perspectives enrich the pursuit of new discoveries and shape the conduct of scientific research for the better.

The Office of the Chief Science Advisor is a founding member of the Federal Interdepartmental Indigenous Science, Technology, Engineering and Math Cluster, commonly known as the I-STEM Cluster. Originally an initiative of Indigenous researchers working with Agriculture and Agri-Food Canada, the I-STEM Cluster was formally created in 2021 with representatives from the OCSA and the departments of Environment and Climate Change, Natural Resources, and Fisheries and Oceans. The I-STEM cluster works to bridge knowledge systems, create inclusive strategies and programs, and promote the hiring, development and retention of Indigenous students.

Since its creation the I-STEM Cluster has grown into a trusted partner within the federal government STEM community and beyond. The Cluster now counts 15 participating departments and agencies and held its first meeting in 2022 with the federal Assistant Deputy Minister / Director General Committee, a reflection of its growing reputation.

*In May 2022, the OCSA co-hosted the third Science Meets Parliament event in Ottawa, bringing together researchers from across the country to engage with members of Parliament.*



## Science Meets Parliament 2022

For science advice to play a larger role in government policy decisions, scientists and decision-makers need to better understand each other's work. On May 9 and 10, 2022, the OCSA and the Canadian Science Policy Centre co-hosted the third Science Meets Parliament event, bringing together Canada's brightest researchers from across the country to meet and engage with members of Parliament.

Science Meets Parliament provides two days of programming designed to build ongoing dialogue between parliamentarians and scientists. Delegates from the scientific community are selected through a rigorous application process based upon their research status, policy interests and potential contributions. This year's 45 successful applicants were paired with a member of Parliament for their visit to Ottawa.

The Chief Science Advisor addressed the delegates on their first day on the importance of effective communication that can improve their audience's science literacy. Dr. Nemer invited delegates to share their "elevator pitches" on their research interests and provided constructive feedback on each one. The delegates then spent the second day meeting with and shadowing members of Parliament to learn about their work and attended Question Period and meetings of House committees, where expert witnesses are called upon to share their perspectives. Science Meets Parliament will be held again in May 2023.

# Youth Council Shares its Vision for Science

Every new cohort of young researchers brings with them the experiences and passions of their generation, further enriching the pursuit of scientific knowledge. The Chief Science Advisor's Youth Council — a diverse group of 20 young scientists from across Canada, and from a wide range of disciplines — was established in 2018 to amplify the voices of young Canadian scientists on current and emerging issues in the science community.

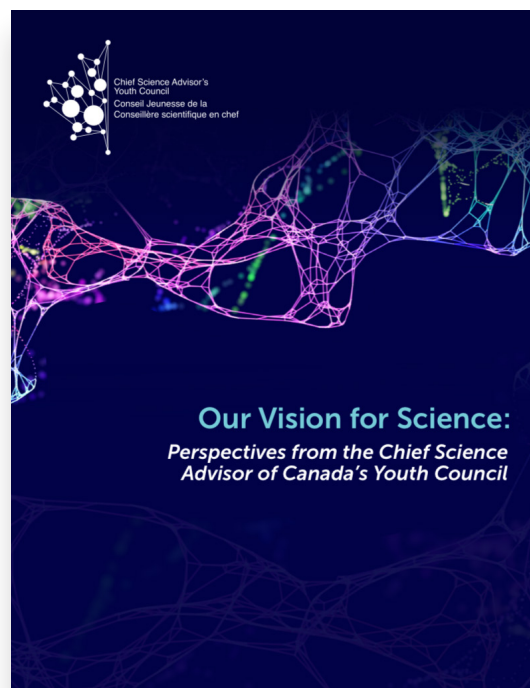
Youth Council members were unable to meet in person for the first two years of their tenure due to pandemic restrictions. Not surprisingly, the Youth Council had a very active year throughout 2022-23, holding its first in-person meetings in Ottawa and producing a report entitled *[Our Vision for Science: Perspectives of the Chief Science Advisor's Youth Council](#)*, which was published in October.

The report is a work of remarkable breadth and scope, with a total of 26 calls to action, for governments and science organizations alike, that would contribute to a stronger national vision and strategy for the future of science and research in Canada. The report proposed measures to build long-term, sustainable research; foster global, multi-sector interdisciplinary collaboration; encourage more people to choose science as a learning and career pathway; foster a reciprocal relationship between science and society; and incorporate next-generation voices in decision-making.

This inaugural Youth Council's term came to an end in February 2023. The incoming cohort of Youth Council membership will be announced in summer 2023 (see Appendix C).



*In June 2022, the Chief Science Advisor's youth council met in Ottawa to discuss their vision for science in Canada and to learn about science in policy making.*



# Communicating with the Canadian Public

In addition to her role as a science advisor and international science ambassador, the Chief Science Advisor is passionate about promoting science literacy in Canada.

The covid-19 pandemic brought into sharp relief the role that scientific concepts and methods play in our everyday lives: faced with a previously unknown pathogen, public and media attention were focused on the incremental creation of knowledge flowing from the study of SARS-CoV-2. It also brought to light the need for improved science literacy in Canada: the ability to understand how to incorporate the knowledge gained from those scientific concepts and processes into everyday life. As technology touches more and more aspects of our lives, from health (how to protect against infectious disease) to entertainment (how to train streaming algorithms) to digital socializing (how to recognize misinformation) and beyond, science literacy is more important than ever.

In this role Dr. Nemer was frequently called upon by the media to speak on a wide range of issues. In the previous year, public interest in science related to the pandemic was at its height. However, many interviews in 2022-23 focused on the winding down of public health restrictions and future pandemic readiness, in which Dr. Nemer helped educate the public on the role of science in government decision-making. In her interviews, Dr. Nemer also seeks out opportunities to advocate for greater representation of women and visible minorities in the Canadian science community, and particularly in leadership roles.

Another emerging theme of Dr. Nemer's public and media appearances, prominent in 2022-23, was the issue of scientific misinformation. She spoke on the topic with a range of media outlets including Radio-Canada, *University Affairs* magazine, and the University of Ottawa Faculty of Medicine news blog.

Accordingly, in all her public appearances, the Chief Science Advisor seeks to provide accurate and helpful information that establishes and strengthens public trust in science.



*The Chief Science Advisor is often called upon by the media to speak on a wide range of science-related issues.*

# Amplifying Science with Canadians: Observations and Future Directions

The issue of misinformation and disinformation about science has become increasingly prominent. Social media often perpetuates misunderstanding and, in some cases, abets malefactors in their deliberate efforts to undermine scientific knowledge and discourse.

The position of Chief Science Advisor provides its titleholder with a public platform from which to foster greater science literacy. In this role, the Chief Science Advisor has sought not only to increase science literacy among Canadians, but also to provide a role model to other scientists to be active in public discussion and debate. When more scientists proactively engage with the public, trusted relations are built, communities are better informed and individuals are more empowered, dampening the reach and impact of misinformation and disinformation.

In Canada, a number of organizations and institutions have programs to encourage scientists and science students to share their knowledge and experience, ranging from the student science ambassador programs at many universities to the Women in Science and Engineering Chairs program of the Natural Sciences and Engineering Research Council of Canada.

Even so, there are models in other countries that offer lessons in how to encourage more scientists to become ambassadors for their disciplines. The American Society for Microbiology, for instance, has an [Ambassador program](#) that spans 33 states as well as 112 countries around the world. The ASM also has a Youth Leaders Circle that is equally global in scope. One of the strengths of the ASM program is that it provides ambassador roles for both young and experienced scientists.

The OCSA encourages Canadian scientific associations to consider creating or expanding ambassador programs to provide more public platforms for scientists of all ages and experiences to engage with the public.

PART 5

# Conclusion

As the Office of the Chief Science Advisor enters its sixth year of operations, it has made great strides in the fulfillment of its mandate. The federal government can now call upon the OCSA, as well as a network of Departmental Science Advisors, to provide science advice in policymaking and in emergencies. The federal government's science workforce is a tremendous public service asset, one whose knowledge and expertise is being better mobilized to serve Canadians through their government. Through this Office, the government can also convene Canada's top subject-matter experts in the private and in academic sectors for science advice on emerging issues.

This annual report demonstrates that the OCSA is providing valuable advice to enhance trust in and use of science for public good through the following initiatives :

- Embedding the principles of open science and open data in federal government research;
- Helping to make publications by federal government researchers accessible to all;
- Promoting Canada's leadership in emerging and critical technologies;
- Leading efforts to showcase Canada's excellence in science and technology globally and enhancing international research cooperation; and
- Helping Canadians better understand and appreciate the role that science plays in their lives.

These efforts will be increasingly valuable in the years ahead. The world has entered a new era of international competitiveness in science, technology and innovation. Ambitious countries are taking concrete steps to join the traditional ranks of scientific leadership by investing in research, development, and science infrastructure. They are establishing, expanding and entrenching science-advice networks within their governments. They recognize that science must be integral to solving global challenges, and to assuring their own national prosperity, in the decades ahead.

This is the world in which Canada now finds itself, and to which it must adjust. Canada remains a global leader in scientific capability, but its status cannot be taken for granted. The Chief Science Advisor encourages consultations with Canada's broader scientific community to develop a vision and strategy for Canada's continued leadership in research and development. Such a vision would galvanize researchers and signal Canada's commitment to knowledge, discovery and innovation. This will promote partnerships and inform future investments.



# APPENDIX A

## DEPARTMENTS' AND AGENCIES' SCIENTIFIC ACTIVITY

The list below shows the top federal departments and agencies in Canada in terms of expenditures in scientific research and development.

	(\$ millions)		
	2020-21	2021-22	2022-23
National Research Council Canada	1714	1436	1442
Canadian Institutes of Health Research	1503	1384	1352
Natural Sciences and Engineering Research Council of Canada	1372	1408	1324
Environment and Climate Change Canada	853	936	1216
Global Affairs Canada	739	1007	1104
Social Sciences and Humanities Research Council of Canada	1419	1016	1073
Innovation, Science and Economic Development Canada	797	834	899
Natural Resources Canada	672	768	788
Statistics Canada	745	1011	733
National Defence	533	628	626
Health Canada	418	540	568
Agriculture and Agri-Food Canada	526	543	557
Canada Foundation for Innovation	389	376	478
Fisheries and Oceans Canada	417	463	468
Public Health Agency of Canada	N/A	384	414
Canadian Space Agency	296	330	348
<b>Sub-Total</b>	<b>12393</b>	<b>13073</b>	<b>13390</b>
Other departments and agencies	2215	1936	2175
<b>Total</b>	<b>14610</b>	<b>15001</b>	<b>15567</b>

\*All data is from [Statistics Canada](#): Table 27-10-0026-01, Federal expenditures on science and technology by major departments and agencies. Release date June 6, 2023.

# APPENDIX B

## CURRENT MEMBERS OF THE DEPARTMENTAL SCIENCE ADVISORS NETWORK

Name	Title	Organization
Sarah Gallagher (outgoing)	Science Advisor to the President	Canadian Space Agency (CSA)
David Hik	Chief Scientist and executive Director, Programs	Polar Knowledge Canada (POLAR)
Joel Martin	Chief Science Officer and Chief Digital Research Officer	The National Research Council (NRC)
John Moores	Science Advisor to the President	Canadian Space Agency (CSA)
Sriram Narasimhan	Departmental Science Advisor	Transport Canada
Marc Saner	Departmental Science Advisor	Natural Resources Canada (NRCan)
Paul Snelgrove	Departmental Science Advisor	Department of Fisheries and Oceans (DFO)
Cara Tannenbaum	Departmental Science Advisor	Health Canada (HC)
Sarah Viehbeck	Chief Science Officer	Public Health Agency of Canada (PHAC)
Jennifer Winter	Departmental Science Advisor	Environment and Climate Change Canada (ECCC)

# APPENDIX C

## MEMBERS OF THE CSA'S YOUTH COUNCIL

Keeley Aird

Justine Ammendolia

Marie-Eve Boulanger

Andréa Cartile

Erin Crockett

Landon Getz

Sara Guzman

Amelia Hunter

Natasha Jakac-Sinclair

Chelsie Johnson

Max King

Audrey Laventure

Chedi Mbagu

Taylor Morriseau

Sophie Poirier

Farah Qaiser

Madison Rilling

Ali Sbayte

Molly Meng Hua Sung

Arthur Van Havre

