THE OPEN SCIENCE DIALOGUES

Summary of stakeholders round tables

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Office of the Chief
Science Advisor of Canada

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INTRODUCTION

A key mission of academic research is to generate new knowledge and disseminate it. Since their establishment following the printing revolution, scientific journals have become the primary vehicle for knowledge dissemination. Additionally, in some fields scholars share the results of their work in books and monographs. Recruitment and promotion as well as granting and award committees rely heavily on the publication track record in their deliberations. They look at the number of publications, the prestige of the journal or publisher and the impact of the work as evidenced by how often it is cited or used by others. Research data that is not part of such publications has not been historically broadly shared, though there are shifts in some disciplines enabled by digital transformation, supporting infrastructure and disciplinary culture.

Scientific publishing has been done historically through subscription journals making research output accessible only to subscribers. The widespread use of Internet has enabled a new model of publishing: Open Access journals. The content of an Open Access journal is freely available online at the time of the publication and journal expenses are paid by the authors via Article Processing Charges (or APCs) instead of subscribers. Some Open Access journals have become leading journals in their disciplines. Many prestigious journals remain subscription-based today although they increasingly offer authors the option to pay APC to make the article freely accessible. As subscription journals moved to an online format, content became freely available only after an embargo period, which can vary between one to three years. Authors have the option to make a preprint or publication openly accessible by depositing a copy into an open repository.

Open Science[1](also known as open scholarship) is the practice of making scientific inputs, outputs and processes freely available to all with minimal restrictions. The benefits of Open Science include increasing access to knowledge, improving reproducibility, reducing duplication, creating opportunities for impact, and accelerating knowledge transfer. Open Science was recognized as a commitment in Canada's Action Plan on Open Government in 2016. The following year, the position of the Chief Science Advisor of Canada was created with the mandate to "provide advice on the development and implementation of guidelines to ensure that government science is fully available to the public." As part of the 2018-2020 Action Plan on Open Government, Canada has committed to creating a Roadmap for Open Science. The Roadmap was released in February 2020 by the Chief Science Advisor of Canada and the Honourable Navdeep Bains, former Minister of Innovation, Science and Economic Development. It articulates a vision, principles and recommendations to make government science fully available to the public. The Office of the Chief Science Advisor (OCSA) has advanced the file across government agencies and science-based departments who have since developed Open Science Action Plans. Among other recommendations, the Roadmap articulates the need for a cohesive Open Science approach for federally-funded Canadian science and suggested consultations with university researchers to be the first step in this process (Recommendation 9). Such consultation was conducted in November 2021 and is the main focus of this document.

Given the complementarity between Open Science and research security, Dr Nipun Vats, Assistant Deputy Minister at Innovation, Science and Economic Development Canada, provided short remarks on research security as part of the discussion on open data during the roundtables with researchers.

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[1] Open Science is defined as "the practice of making scientific inputs, outputs and processes freely available to all with minimal restrictions. Scientific research outputs include (i) peer- reviewed science articles and publications, (ii) scientific and research data and (iii) public contribution to and dialogue about science. Open Science is enabled by people, technology and infrastructure. It is practiced in full respect of privacy, security, ethical considerations and appropriate intellectual property protection."
(Roadmap for Open Science, Feb 2020)

COVID-19 PANDEMIC AND OPEN SCIENCE

The COVID-19 pandemic has demonstrated the vital importance of Open Science with the rapid development of diagnostics and vaccines having been enabled by immediate and open access to research data and scientific publications. This was the result of the research community, research funders and publishers agreeing on openly sharing all COVID-19 research data and findings without delay. The chief science advisors and equivalents from 16 countries including Canada had released a Call for Open Access to COVID-19 Publications asking the publishing industry to make COVID-19 publications openly available in both human-and machine-readable formats.

OPEN SCIENCE DIALOGUES

Five Open Science Dialogues were organized by the OCSA in November 2021 with the objective to solicit practical approaches and suggestions on how to achieve open and secure science in Canada. Over eighty participants took part in the dialogues, including leading Canadian researchers from diverse groups, disciplines, geographies and career stages, as well as representatives from key national and international research funders (Appendix A). Researchers were selected based on their prominence in their respective fields and not their prior Open Science achievements or advocacy. This summary of stakeholder roundtables aims to capture the opinions expressed but might not represent the view of all participants.

SUMMARY OF OPEN SCIENCE DIALOGUES WITH RESEARCHERS

Open Access to publications

Points of agreement

- Open Access publishing provides much-needed access to industry, policy-makers, smaller post-secondary institutions in Canada or those in developing countries, and more broadly to the public. Further, Open Access publishing confers a citation advantage, and the inability to do so places researchers at a disadvantage.

- The process for making publications openly accessible is a key element to improving compliance with Open Access policies.

- The costs associated with publishing in general and with Open Access publishing in particular need to be addressed. Paid from the research grants, the costs are deemed prohibitive to early career researchers as well as to many researchers, especially in natural and physical sciences.

- The knowledge about different routes to achieve Open Access, as well as how to assess the quality of Open Access journals varies among researchers and trainees and an awareness campaign would be beneficial.

Other considerations

- Early career researchers need support to maximize the impact of their publications through Open Access publishing.

- The current research evaluation system is a barrier towards achieving Open Access, as it uses the number of publications and prestige of journals as a metric.

- An Open Access mandate can be interpreted to be counter to Indigenous self-determination. Some Indigenous scholars want to publish in Open Access to make publications available to communities but find it difficult to afford.

- Canadian university libraries have been experiencing budget cuts, smaller university libraries being the hardest hit, resulting in the elimination of several journal subscriptions. This may lead to unequal access to scholarly literature for researchers and educators in smaller institutions.

- Publishing a monograph in an Open Access format remains a challenge for technical and financial reasons.

- Copyrighted material can often be included in the articles in the humanities disciplines. In such cases, the price of the APC would depend on the number of readers, which is hard to predict and control in the case of Open Access publishing.

- Many researchers choose to deposit preprints into a repository as a way of rapidly sharing their research findings in a cost-effective way. Some researchers noted that preprints can be misunderstood by the public. In an effort to increase knowledge mobilization, lay summaries may be considered.

Suggested solutions

- In the short term, establish an Open Access fund that would cover APCs in an equitable way.

- For the longer term, double down on collective negotiations with big publishers to drive down the price of Open Access publishing and/or to achieve cost-effective transformative agreements.

Open data

Points of agreement

- Opening research data leads to better science by increasing reproducibility, demystifying the research process, building trust in science-informed policymaking and maximizing investments in research.

- Data should be as open as possible, as closed as necessary. The types of data that should not be open by default include Indigenous data, health and personal data where consent for secondary use was not provided, data for commercialization, industry partner data and other sensitive or confidential data.

- Data and metadata quality has been identified as an issue. The generation and sharing of high-quality data require training, resources and incentives.

- Datasets are often not interoperable. There are no dedicated human or financial resources for making datasets work together.

- Researchers highlighted the importance of sharing software and source code in order to increase reproducibility and enable data reuse as often open data cannot be analyzed without open software.

- Access to research materials such as samples, is also important and in need of attention.

- Research security was acknowledged as an important consideration. Open Science and research security are not mutually exclusive but rather complementary concepts.

- Safe and secure repositories are critical for Canadian research as well as for achieving open data.

Other considerations

- The current research evaluation system is a barrier towards achieving open data, as researchers' contributions towards metadata, data maintenance and ensuring dataset interoperability are not recognized.

- Lack of clarity on data governance and data sharing rules is a barrier. The key questions are around ownership (*Who owns the data?*),

(Cont'd)

accountability (*Who pays to maintain repositories and ensure the quality and interoperability of data? Who is responsible if data are misinterpreted?*) and rewards (*How data generators are recognized?*).

- Building capacity for safe and long-term curation is needed. This requires both human and financial resources dedicated to building and maintaining the necessary infrastructure.

- An ethical perspective needs to guide policies on open data since it can introduce inequities at local and global levels.

- CARE Principles of Indigenous Data Governance and the First Nations principles of ownership, control, access, and possession (OCAP) need to be respected and used when dealing with Indigenous data. Indigenous data should not be open by default, instead, the community should decide whether it is appropriate to make data open (e.g. in the case of linguistic data, the community wants data to be accessible to future generations) or closed.

- The right balance between security and openness needs to be achieved, as there are concerns that research security may negatively impact research and collaborations. Strategy on safeguarding science has to be clear, consistent and transparent, and include a transparent oversight and process review with the ethics and human rights framework in place.

Suggested solutions

- Given the various categories of research and observational data, there is no one-size-fits-all solution for open data. An in-depth analysis and further consultations are needed to develop solutions for various types of data.

- Recognize and reward researchers' contributions towards metadata, data maintenance and ensuring the interoperability of datasets.

- Provide training opportunities for researchers and trainees on data storage, data management, data governance and privacy.

SUMMARY OF OPEN SCIENCE DIALOGUES WITH FUNDERS

International context

Since the release of the Roadmap for Open Science, the international Open Science landscape has continued to evolve. A major milestone was the unanimous adoption of the UNESCO Recommendation on Open Science by the 193 Member States in November 2021. Also in 2021, France released its Second Plan for Open Science that provides a coherent and funded plan to enable publicly-funded research (publications, data, source code and algorithms) to become open. The UK's national research and innovation funder, UKRI, updated its Open Access policy which includes funding to support open access research articles, as well as open access negotiations. In Germany, Projekt DEAL, a consortium of universities and research libraries, negotiated directly with the publishers and achieved big transformative agreements in 2020. Other countries (e.g. Netherlands, Norway, Switzerland) and research institutions (e.g. the University of California system) have also negotiated transformative agreements.[2]

International trends in Open Access publishing include posting preprints in open repositories, requiring immediate (i.e. no embargos) access in Open Access or transformative journals, providing financial support for publications and negotiating with the publishers to lower the cost. Other key trends include using an equity lens when designing Open Science policies, rethinking research evaluation and focusing on enabling open data and open software. Given that the publishing industry is expanding its scope to the entire research lifecycle, many peer nations are developing open data and open software policies and enabling infrastructures to ensure that data stays in the public domain.

[2] Transformative agreement is an umbrella term describing those agreements negotiated between institutions and publishers in which former subscription expenditures are repurposed to support open access publishing of the negotiating institutions' authors, thus transforming the business model underlying scholarly journal publishing, gradually and definitively shifting from one based on toll access (subscription) to one in which publishers are remunerated a fair price for their open access publishing services. (ESAC).

Canadian context

In Canada, research charities along with provincial and federal funders have diverse sets of Open Science policies (and some have none). In 2021, the Quebec government's major research funding agency, le Fonds de Recherche du Québec, joined cOAlition S[3] in a commitment to the implementation of immediate Open Access to scientific publications by March 2023. The Tri-Agency Open Access Policy on Publications (2015) applies to publications arising from agency-supported research and requires them to be freely accessible within 12 months of publication (via journal and/or online repository). There is no dedicated Tri-Agency fund to support costs associated with OA publishing, but the agencies consider these costs to be eligible grant expenses. Social Sciences and Humanities Research Council (SSHRC) directly funds Canadian social sciences and humanities Open Access journals through the Aid to Scholarly Journals program. In instances of non-compliance, the agencies may take enforcement steps/exercise recourse in accordance with the Tri-Agency Framework: Responsible Conduct of Research.

Points of agreement

- Canada is not an international leader in Open Science but could catch up if actions are taken now.

- Canadian funders (foundations, federal and provincial funders) have diverse sets of Open Science policies but are open to harmonizing their policies.

- Research evaluation metrics need to be reviewed in parallel with the evolving trends in knowledge dissemination and translation. This requires cooperation between institutions, funders and the research community.

[3] cOAlition S is a group of research funding organizations that support Plan S, an initiative to make full and immediate Open Access to research publications a reality.

Other considerations

- There is concern about how immediate Open Access could financially affect some scientific and learned societies who have in-house publishers; models exist to mitigate such impacts.

- Current evaluations and international rankings of universities are partially based on the number of publications and their percentage in leading (often not open access publishing) journals. This needs to be reviewed in the context of Open Science.

Suggested solutions

- Making Open Access publishing an easy and attractive option for researchers is key to successful Open Science adoption.

- Science is a global enterprise, and Canada needs to coordinate its efforts with international partners (including in its approach to Open Access and research evaluation).

- There is an opportunity to harmonize Open Science policies across research funders in Canada, taking into account the evolving international context.

CONCLUSION

Participants in the Open Science Dialogue embraced the notion of Open Science but raised significant practical and logistical challenges towards achieving it. They also proposed solutions, particularly in the area of Open Access to publications. Researchers reiterated their support for the Roadmap for Open Science and for a cohesive approach to making publicly-funded research in Canada openly accessible. The rationale for domestic and international harmonization was emphasized since many projects benefit from multiple domestic and international funding and collaborations.

The importance of research security was acknowledged by participants who would benefit from better institutional support to safeguard their research data. Data management and stewardship as well as the other elements of Open Science - data and tools - require attention and further consultation and support.

There is an agreement that national leadership is needed, and the research community has encouraged the Chief Science Advisor to continue exploring ways to facilitate and enable the adoption of Open Science. Making Canadian research openly accessible will enhance its visibility and competitiveness on the international scene, which in turn would attract talent and research investments to the country. It will also help early career researchers and those in small institutions who have less support for knowledge disseminating. Importantly, enabling Open Science will make federally funded research open to the public including to innovators and policymakers in a timely manner, thus maximizing return on investments as exemplified during the COVID-19 pandemic.

APPENDIX A

Open Science dialogues participants

Co-Chairs

Mona Nemer, the Chief Science Advisor of Canada

David Castle, Researcher in Residence, Office of the Chief Science Advisor of Canada

Open Science dialogues with Canadian researchers

Canadian researchers

Tracie Afifi, Max Rady College of Medicine, University of Manitoba

Alán Aspuru-Guzik, Department of Chemistry, University of Toronto

Jennifer Bain, Fountain School of Performing Arts, Dalhousie University

Cecilia Benoit, Canadian Institute for Substance Use Research and Department of Sociology, University of Victoria

Yves Bergeron, Forest Research Institute, Université du Québec en Abitibi-Témiscamingue

Marie-Eve Boulanger, Department of Physics, Université de Sherbrooke

Susan Brown, School of English and Theatre Studies, University of Guelph

Jillian Buriak, Department of Chemistry, University of Alberta

Stephanie Carvin, The Norman Paterson School of International Affairs, Carleton University

William Cheung, Institute for Oceans and Fisheries, University of British Columbia

Wendy Hui Kyong Chun, School of Communication, Simon Fraser University

Jennifer Clapp, School of Environment, Resources, and Sustainability, University of Waterloo

Leah Cowen, Department of Molecular Genetics, University of Toronto

Ashlee Cunsolo, School of Arctic and Subarctic Studies, Labrador Campus of Memorial University

Jeff Dahn, Department of Physics & Atmospheric Science, Dalhousie University

Rozita Dara, School of Computer Science, University of Guelph

Jeremy de Beer, Faculty of Law, University of Ottawa

Connie Eaves, Department of Medical Genetics and School of Biomedical Engineering, University of British Columbia

Elizabeth Edwards, Department of Chemical Engineering and Applied Chemistry, University of Toronto

Alan Evans, Department of Neurology and Neurosurgery, McGill University

Yves Frenette, Department of Humanities and Social Sciences, Université de Saint-Boniface

Chantal Guillemette, Faculty of Pharmacy, Université Laval

Landon Getz, Department of Microbiology and Immunology, Dalhousie University

Marianne Ignace, Department of Linguistics, Simon Fraser University

Vincent Larivière, School of Library and Information Science, Université de Montréal

Julie LaRoche, Department of Biology, Dalhousie University

Audrey Laventure, Department of Chemistry, Université de Montréal

Anita Layton, Department of Applied Mathematics, University of Waterloo

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Ian Milligan, Department of History, University of Waterloo

Sylvain Moineau, Department of Biochemistry, Microbiology and Bioinformatics, Université Laval

Taylor Morisseau, Department of Pharmacology and Therapeutics, University of Manitoba

Nitika Pant Pai, Department of Medicine, McGill University

Guillaume Paré, Department of Pathology and Molecular Medicine, McMaster University

Fanie Pelletier, Department of Biology, Université de Sherbrooke

James Pinfold, Faculty of Science - Physics, University of Alberta

Joelle Pineau, School of Computer Science, McGill University

Farah Qaiser, Evidence for Democracy

John Smol, Department of Biology, Queen's University

Gregory Steinberg, Department of Medicine, McMaster University

Laurent Turcot, Department of Humanities and Social Sciences, Université du Québec à Trois-Rivières

Danielle Way, Department of Biology, University of Western Ontario

Salim Yusuf, Population Health Research Institute, McMaster University, Hamilton Health Sciences

Presenter

Nipun Vats, Assistant Deputy Minister, Science and Research Sector, Innovation Science and Economic Development (ISED)

Observers

Suzanne Board, Deputy Director, Corporate Strategy and Performance Division, Social Sciences and Humanities Research Council (SSHRC)

Alison Bourgon, Director General, Science Policy Branch, Canadian Institutes of Health Research (CIHR)

Leigh-Ann Butler, Policy Analyst, Policy and Government Relations, Natural Sciences and Engineering Research Council of Canada (NSERC)

Shannon Cobb, Senior Advisor, Science Policy — Knowledge Mobilization Strategies, CIHR

Amanda Crupi, Manager, Science Policy, CIHR

Marc Fortin, Vice-President of Research Partnerships, NSERC

Ted Hewitt, President, SSHRC

Matthew Lucas, Executive Director of the Corporate Strategy and Performance Division, SSHRC

Kori St-Cyr, Director, Policy and Government Relations, NSERC

Open Science dialogues with international Open Science leaders

International paticipants

Claudia Maria Bauzer Medeiros, Research Program on eScience and Data Science, FAPESP, Brazil

Patrick Furrer, Coordinator - National Programme on Open Science, SwissUniversities, Switzerland (former)

Konstantinos Glinos, Head of Unit for Open Science, DG RTD, European Commission, EU

Angela Holzer, Programme Director, Scientific Library Services and Information Systems, Deutsche Forschungsgemeinschaft (DFG), Germany

Lyric Jorgenson, Acting Associate Director for Science Policy and Acting Director of the Office of Science Policy, NIH, USA

Robert Kiley, Head of Strategy, cOAlition S

Ritsuko Nakajima, Director, Department for Information Infrastructure, Japan Science and Technology Agency (JST), Japan

Yasushi Ogasaka, Director, Department of R&D for Future Creation, Japan Science and Technology Agency, Japan

Manish Parashar, Director, Office of Advanced Cyberinfrastructure, National Science Foundation (NSF), USA

Alain Schuhl, Chief Research Officer, French National Centre for Scientific Research (CNRS), France

Jerry Sheehan, Assistant Director for Scientific Integrity & Data Access, White House OSTP, USA

David Sweeney, Executive Chair of Research England, UK Research and Innovation (UKRI), UK

Dario Taraborelli, Science Program Officer, Open Science, Chan Zuckerberg Initiative (CZI), USA

Canadian participants

Tammy Clifford, Vice-President Research - Learning Health Systems, CIHR

Danika Goosney, Vice-President, Research Grants and Scholarships Directorate, NSERC

Valérie La Traverse, Vice President Corporate Affairs, SSHRC

Sinead Tuite, Senoir Director, Science and Research Sector, ISED

Open Science dialogue with with Canadian funders

Alejandro Adem, President, NSERC

Rob Annan, CEO, Genome Canada

Alan Bernstein, CEO, CIFAR

Mylène Deschênes, Director of Ethical and Legal Affairs, Fonds de recherche du Québec (FRQ)

Rollie Dykstra, Executive Vice President Impact, Alberta Innovates

Naser Faruqui, Program Director, Education and Science, International Development Research Centre

William Ghali, VP Research, University of Calgary

Mary Elizabeth Harriman, Director, Research and Partnerships, Heart and Stroke Foundation

John Hepburn, CEO and Scientific Director, Mitacs

Ted Hewitt, President, SSHRC

Chonnettia Jones, VP Research, Michael Smith Health Research BC

Laura Kilcrease, CEO, Alberta Innovates

Mark Leggott, Director of International Relations, Digital Research Alliance of Canada

Stefan Leslie, CEO, Research Nova Scotia

Mohamad Nasser-Eddine, Director, Programs, Canada Foundation for Innovation

Guy Rouleau, Director, The Neuro

Iain Stewart, President, National Research Council of Canada

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Sarah Viehbeck, Associate Vice-President Research - Evidence Integration, CIHR

James Woodgett, President and Scientific Director, Terry Fox Research Institute

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Alexandre Bourque-Viens, Office of the Chief Science Advisor of Canada

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