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WEAVING OPEN DIALOGUE USING CANADA'S OPEN SCIENCE ROADMAP FRAMEWORK

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Abstract

Open science (OS) as a movement has transformative potential in making the process of scientific research transparent and collaborative as well as the outputs freely accessible to all in society. However, these opportunities and challenges are subject to biases and entrenched in power disparities. In addition, the very broad nature of open science also invokes challenges in having meaningful discussions. In 2020, the Government of Canada unveiled a national framework, *Roadmap to Open Science*, which provided overarching principles and recommendations to allow federal science to be open to all.

The University of Toronto (U of T) used this national open science framework to guide an international group of researchers and librarians to discuss open science in practical terms and engage the audience in being part of the dialogue. The five high-level principles of People, Transparency, Inclusiveness, Collaboration, and Sustainability were used as the structure in order to guide discussions into the current state of open science practices on-the-ground in academia. The University of Toronto Library (UTL) partnered with the Centre for Research & Innovation Support (CRIS) to host engaging conversations in a series of five virtual panels, *Open Science: Following the Roadmap for Research*, held in November 2021. The panelists consisted of librarians, faculty, and researchers from local, national as well as international institutions and organizations. Two core considerations on developing the make-up of the panels were to ensure diversity amongst panelists and have librarians included in every panel. The conversations were thought-provoking and touched-on aspects such as who is included and excluded in the various stages in research, implications of funding and control, infrastructure, power dynamics, and preservation of information. This paper will discuss the open science panel series and common themes which emerged from the conversations.

Keywords: Open science, OS, Canada, Academic libraries, National framework

1. Introduction

This paper is a descriptive case study of how a Canadian academic library engaged the larger community in a fulsome open science discussion using a national framework.

1.1 Defining Open Science

Open science (OS) is difficult to define as it is a set of principles, a set of practices, as well as an ambitious goal. It is not a unified movement with a coherent ideology. Open science also encompasses many participants such as individual researchers, universities or individual faculties or departments, consortiums of research institutes, governments, non-governmental organizations,

publishers, funding bodies, citizens, and libraries. Vicente-Saez and Martinez-Fuentes (2018) state that a lack of a formal definition leads to a deficiency of common understanding and therefore awareness of open science. UNESCO is in agreement that without a global consensus of a clear definition and common understanding of OS there is a barrier to transitioning and moving forward to realize the benefits of open science (UNESCO, 2020).

Variations of open science definitions result from the different perspectives of the organizations or players involved. Vicente-Saez and Martinez-Fuentes (2018) conducted a systematic review to define open science and the resulting integrated definition is “open science is the transparent and accessible knowledge that is shared and developed through collaborative networks” (p. 434). The *UNESCO Recommendation on Open Science* (2021) has quite a fulsome definition whereby:

“open science is defined as an inclusive construct that combines various movements and practices aiming to make multilingual scientific knowledge openly available, accessible and reusable for everyone, to increase scientific collaborations and sharing of information for the benefits of science and society, and to open the processes of scientific knowledge creation, evaluation and communication to societal actors beyond the traditional scientific community. It comprises all scientific disciplines and aspects of scholarly practices, including basic and applied sciences, natural and social sciences and the humanities, and it builds on the following key pillars: open scientific knowledge, open science infrastructures, science communication, open engagement of societal actors and open dialogue with other knowledge systems” (p. 7).

Two separate and strong motivations exist for pushing forward open science. One motivation is the belief that access to science and participation in the scientific endeavor is a human right from which everyone should have access to and derive benefit (Petitgand, Régis, & Denis, 2019). Another strong incentive towards open science practices is that which aims to curb the reproducibility crisis across the sciences and implement procedures that increase transparency, research ethics, publication ethics, trust in science, and in concert reduce research waste (Baker, 2016; Robson et al., 2021). Practices such as making data and code accessible, pre-registration of studies, intentionally publishing research outputs open access despite funding mandates, and open peer review, all contribute to stronger research outcomes. These two ideological motivations are not mutually exclusive and overlap in many aspects with the aim of making science open and accessible to all in society via a variety of avenues.

A key objective of open science is to increase the diversity of actors involved in all stages of performing science as well as accessing the outputs and benefits. Unfortunately, this goal faces a number of barriers. Bahlai et al. (2019) summed this up very clearly “open science is built on the same foundations as science itself and inherits many systematic barriers that already exist in mainstream science” (p. 78). This article went on to assert “open science by itself cannot fix all the problems that its proponents claim it will solve, because the problems of bias and inequality are inherent in our broader culture” (p. 82). Barriers of wealth and access continue to exist between the global north and the global south. Unequal distribution to wealth, funding, access to internet and open infrastructure at the individual and institutional level in all countries impact access to paywalled research and the ability to afford the article processing charges of open access publishing. In addition, the ongoing systemic barriers of socioeconomic status, gender, and race continue to feed power and decision-making dynamics and prevent full participation in the process of and publishing of science. There needs to be an intention to address these barriers to create a closer alignment between science and society.

1.2 Open Science in Canada

In the report, *Toward a UNESCO Recommendation on Open Science: Canadian Perspectives* (2020) Chan, Bourgeois-Doyle, Donaldson and Haine-Bennett state “Canada would be well served by a national consensus” (p. 1). The Canadian federal government has made open science a priority. On February 26, 2020, the federal Government of Canada published the *Roadmap for Open Science* which provided a plan to make federal science open and ultimately make science more transparent, inclusive, and accessible. The *Roadmap for Open Science* defines OS 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” (p. 11).

The roadmap is based on five principles:

1. People - shared commitment between all stakeholders.
2. Transparency - scientific research outputs are “Open by Design and by Default”; they are “FAIR”, i.e. Findable, Accessible, Interoperable and Reusable.
3. Inclusiveness - in achieving open science, diverse and inclusive approaches are used, reflecting the breadth of perspectives across scientific communities and knowledge systems
4. Collaboration - open science enables collaborations between and among intramural and extramural science communities, within Canada and globally.
5. Sustainability - the practice of open science requires a sustainable approach with concrete steps forward and the commitment necessary to achieve the long-term vision.

Academic libraries in Canada have long been involved in specific OS aspects such as open access advocacy and research data management. However, engagement with OS on a broader scale could be deepened. In a 2021 scoping review published about health sciences librarians’ engagement in open science, 54 studies were included and of these only three were from Canadian universities – two descriptive research papers on open access and another descriptive research study on open data. Furthermore, the authors discussed library involvement in European and African countries in collaborating with national OS efforts. The North American libraries used national policies, such as the NIH public access policy, to justify development of OS services even though libraries were not directly coordinating with the national government (Giustini, Read, Deardorff, Federer, & Rethlefsen, 2021). Using the Canadian OS roadmap would therefore be an effective construct to furthering a library's engagement with OS.

1.3 Open Science and Libraries

Many of the traditional roles, resources, and services of academic libraries naturally fit or can be expanded to support a robust open science agenda. Libraries have been at the forefront of advocating, promoting, and supporting open access publishing and negotiating ways to mitigate the high costs of article processing charges. Many academic libraries also support open access publishing via partnerships with university presses. Research data management is strongly supported through specialized librarian positions, workshops, training, collaborations and working with faculty to ensure funding mandates are met regarding data and open access. Librarians are also involved as collaborators, advisors, advocates, and teachers with regards to research ethics, publishing ethics, alternative assessment methods such as altmetrics, researcher identity, and the creation and promotion of open educational resources. Libraries also create and maintain critical parts of the digital infrastructure through the creation, stewardship, and curation of institutional and data repositories (Ogunbeni, Obiamalu, Ssemambo & Bazibu, 2018; Redkina, 2021; Robson et al., 2021; Tzanova, 2020).

Redkina (2021) states that “over the years, the relationship between open science and research libraries has grown significantly” (p. 244). A significant area of strength libraries can draw upon lies in the deep network of faculty and student relationships as well as relationships with publishers, research offices, and external information technology (IT) departments. With a wide network and placement at the heart of the academic research ecosystem, libraries can leverage their relationships into deeper collaborations to learn, research, and move forward critical aspects of open science (Ogungbeni et al., 2018; Potterbusch, 2018; Vrancken Peeters, 2021). Libraries can also lead campus wide discussions on open science and bring together various researchers, administrators, and IT for engaging thoughtful dialogue (Ogungbeni et al., 2018; Robson et al., 2021). Libraries are well positioned to be leaders in many aspects of open science by forming collaborations within and beyond academic institutions and by intentionally working towards the sea change and cultural changes required across the research and dissemination landscape (Ayrís, 2021; Potterbusch, 2018; Tzanova, 2020).

1.4 Overview of the University of Toronto, University of Toronto Libraries, and the Centre for Research & Innovation Support

Founded in 1827 and situated in the world’s most diverse city, the University of Toronto (U of T) is Canada’s top university, and one of the world’s top-ranked public research-intensive universities. U of T has three campuses: St. George (downtown), Mississauga (in the west), and Scarborough (in the east), and operates on the traditional territory of the Huron-Wendat, the Seneca, the Mississaugas of the Credit, the Anishinaabeg, the Chippewa, and the Haudenosaunee peoples. U of T offers education to over 97,000 students across various academic levels, with over 700 undergraduate programs, and over 300 graduate programs in a wide variety of fields. U of T has more than 15,000 faculty, approximately 10,000 staff, and 163 librarians. As a research university, U of T secured over a total of \$1.45 billion in sponsored research funding in 2020.

The University of Toronto Libraries (UTL) is the third largest library system in North America, consisting of 44 libraries across the tri-campus supporting learning, teaching and research. The collection consists of more than 12 million volumes in 341 languages, 1,500,000 electronic resources in various formats, 28,000 linear metres of archival material and 500 terabytes of data. With innovative services, supports, and inspiring spaces, librarians have strong relationships with faculties, and departments through liaison and functional specialists – collaborating and supporting the university’s mission of teaching, research, and innovation.

The Centre for Research & Innovation Support (CRIS) was created in 2019 as a joint endeavour by the Division of the Vice-President, Research & Innovation (VPRI), University of Toronto Libraries, and the Office of the Chief Information Officer (CIO) with the mission to increase the visibility of research and innovation supports to the tri-campus community. CRIS acts as a single point of contact to assist with navigating and coordinating support for faculty and divisional research offices, and serves as a bridge to existing services, resources, training, tools and expertise offered across the university. CRIS also promotes opportunities to bring people together, creating space and supports for collaboration and partnership, within and outside of the University, as well as coordinate and deliver services and resources related to emerging unmet needs.

2. Planning the Open Panel Series

2.1 National Framework for a National Discussion

In Spring of 2021 the five heads, or directors, of the science libraries at U of T collaborated to create an open science event that would use the national framework, *Roadmap to Open Science*, as the structure for the panels. The *Roadmap to Open Science* articulates a vision, principles, and recommendations to make government science fully available to the public. The five high-level principles of People, Transparency, Inclusiveness, Collaboration, and Sustainability provided structure as well as breadth to guide discussions on a topic that is both an endgame as well as a set of principles and a set of practices. As many OS discussions had been taking place in Europe and the United States (Ayrís & Ignat, 2018; Giustini et al., 2021), it was important to increase engagement with Canadian libraries and researchers using a national framework.

The 5 principles lent themselves to 5 panel discussions, with each of the science library department heads being responsible for one panel. Planning started in Spring 2021 for sessions held in November 2021. Since UTL is a partner in CRIS, a collaboration with CRIS made natural sense to encourage the engagement and participation of faculty across the university. Planning involved securing speakers, moderators, and conference technology; coordinating prep-calls; developing and executing a communications strategy; and creating session assets.

The sessions were scheduled for every Tuesday during the month of November 2021. In the spirit of being 'open', all sessions were recorded, transcripts were edited to meet accessibility standards, and certain presenter slides were made available through the creation of the *Open Science: Following the Roadmap for Research Collection* in U of T's TSpace repository for public viewing. All sessions were virtual and synchronous using Zoom Webinar software.

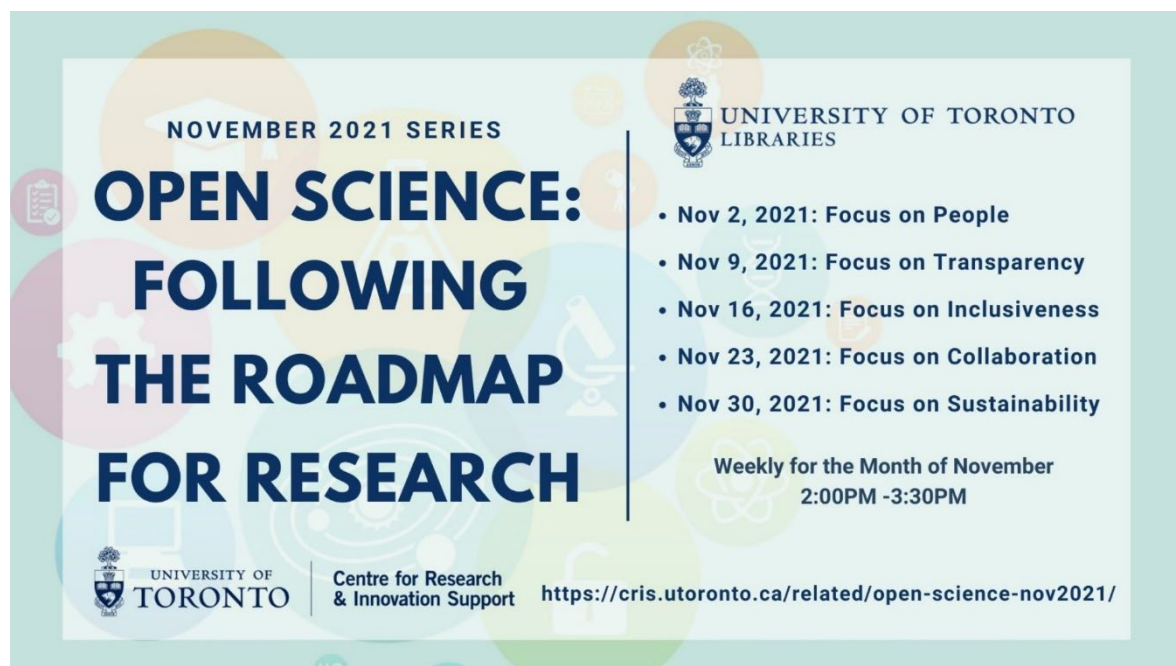


Figure 1: Open Science: Following the Roadmap for Research Series

2.2 Planning Principles

The two guiding principles to develop this series of panel discussions were:

1. Diversity and inclusivity were core in inviting experts to be part of each panel. The aim was to build a diverse set of speakers from the ground up.

2. Librarians were to be included in every panel, either as a speaker or moderator, as a declarative statement that librarians have a seat at the table in many or all aspects of open science. It was important to show this, not only to faculty and researchers, but also to librarian colleagues as well. Potterbusch (2018) states “when working on a project designed to support a heterogenous community, such as you often find in open science, each collaborator’s expertise and knowledge contributes a small piece of the puzzle until the final product is developed or the goals of the initiative are achieved” (p. 45). The planning team wanted to illustrate that librarians have multi-faceted expertise that contributes on an equal playing ground to the generation and dissemination of data and information.

2.3 Focus on People Panel

A fulsome description of the first session, *Focus on People*, is provided, with cursory overviews of each of the other panel sessions to adhere to the time limitations of the oral presentation.

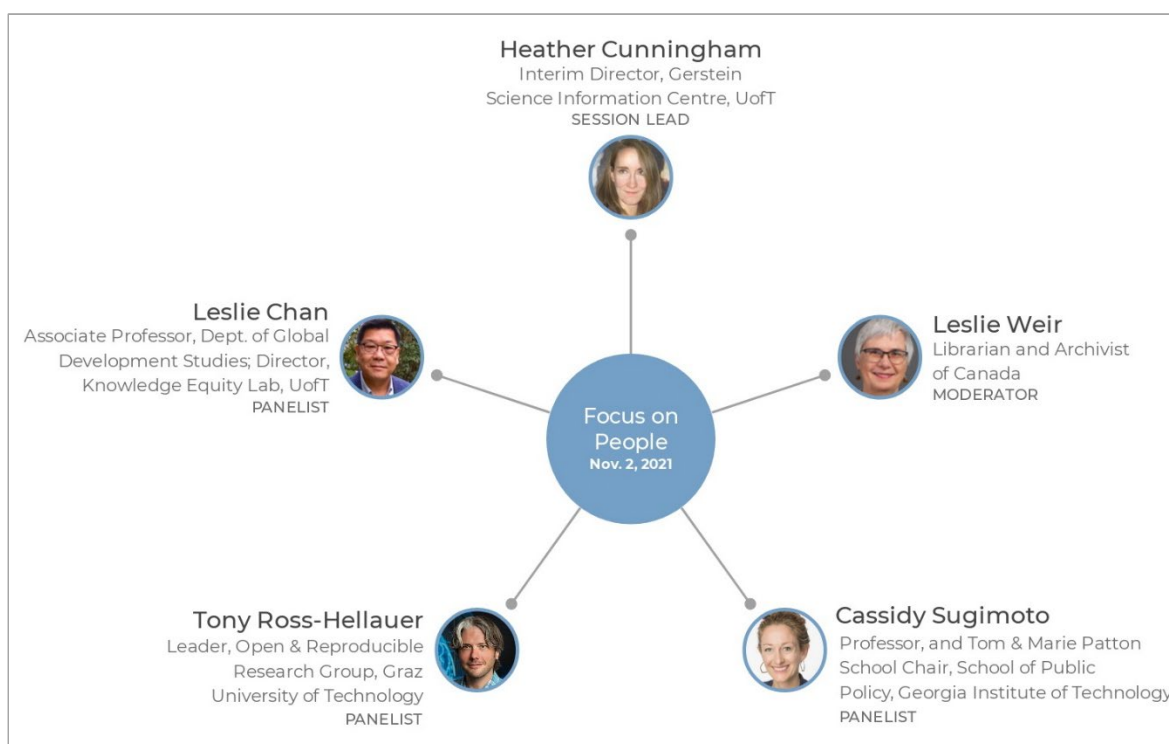


Figure 2: Focus on People

Leslie Wier, Librarian and Archivist of Canada, was invited to be the moderator of the session. Leslie chaired the Open Science Roadmap Advisory Committee which informed the federal *Roadmap for Open Science* publication.

The following panelists were invited:

Leslie Chan is Associate Professor in the Department of Global Development Studies, and Director of the Knowledge Equity Lab at the University of Toronto. Leslie has a long-standing interest in the geo-politics of academic knowledge production and practices on open access. More recently, he has been focusing on how privatized infrastructure has entrenched inequity in knowledge making, and reimagining infrastructure with equity and justice at the core.

Tony Ross-Hellauer is leader of the Open and Reproducible Research Group and Senior Researcher at Know-Center. His research focuses on a range of issues related to open science evaluation, skills, policy, governance, monitoring and infrastructure. Tony is the coordinator of the H2020 project ON-MERRIT which researches issues of equity in open science.

Cassidy Sugimoto is a Professor and Chair in the School of Public Policy at Georgia Institute of Technology. Her research examines the formal and informal ways in which knowledge is produced, disseminated, consumed, and supported, with an emphasis on issues of diversity, equity, and inclusion.

Discussions of open science often refer to specific outputs, processes and procedures, however people are often inferred in broad concepts of equity or collaboration. People are often not discussed as specific actors facing specific obstacles and challenges. It was, therefore, important to dedicate a panel to focus on the people trying to participate and benefit from open science.

All three speakers discussed the reality that open science does not always lead to an increase in equity. The systemic disparities and barriers caused by gender, race and ethnicity which impact education, authorship, citation counts, obtaining funding, and leadership are still very much in effect and therefore impact whose voices get heard, and whose voices do not get heard, who are the decision makers, which research questions get asked, who gets funding, who gets promotions and tenure, and who gets left behind or who has to leave academia because of limited opportunities and support. The COVID-19 pandemic put a spotlight on the disparities which already existed within academia and many parts of society.

A deep dive was taken to discuss who truly benefits from OS. Academic knowledge production largely takes place in a closed geopolitical power structure whereby the global north and well-funded institutions continue to reap benefits. Much of the infrastructure, publishing, and funding is still largely in the realm of the rich and the powerful. Open science does not automatically mean an increase in equity due to the systemic nature of disparities.

Rewards and incentives were discussed as they are strong motivators of behaviour. The current reward system is very object-oriented – counting papers, citations, funding amounts, etc. The competition-focused reward system would have to be re-framed to one that sees knowledge as relational and not a set of products, and one that is focused around what is good for science such as openness, building community, ethical behaviour, intentional actions to increase diversity, and access to research.

The conversation ended on a positive note. All speakers were in agreement that libraries are completely central to open science and librarian roles are multi-faceted as researchers, publishers, administrators, and specialists such as in OS training and Research Data Management (RDM) expertise. It was also noted that libraries often do not receive the necessary resources and funding for their roles.

2.4 Highlights of Remaining Open Science Panels

Focus on Transparency Panel

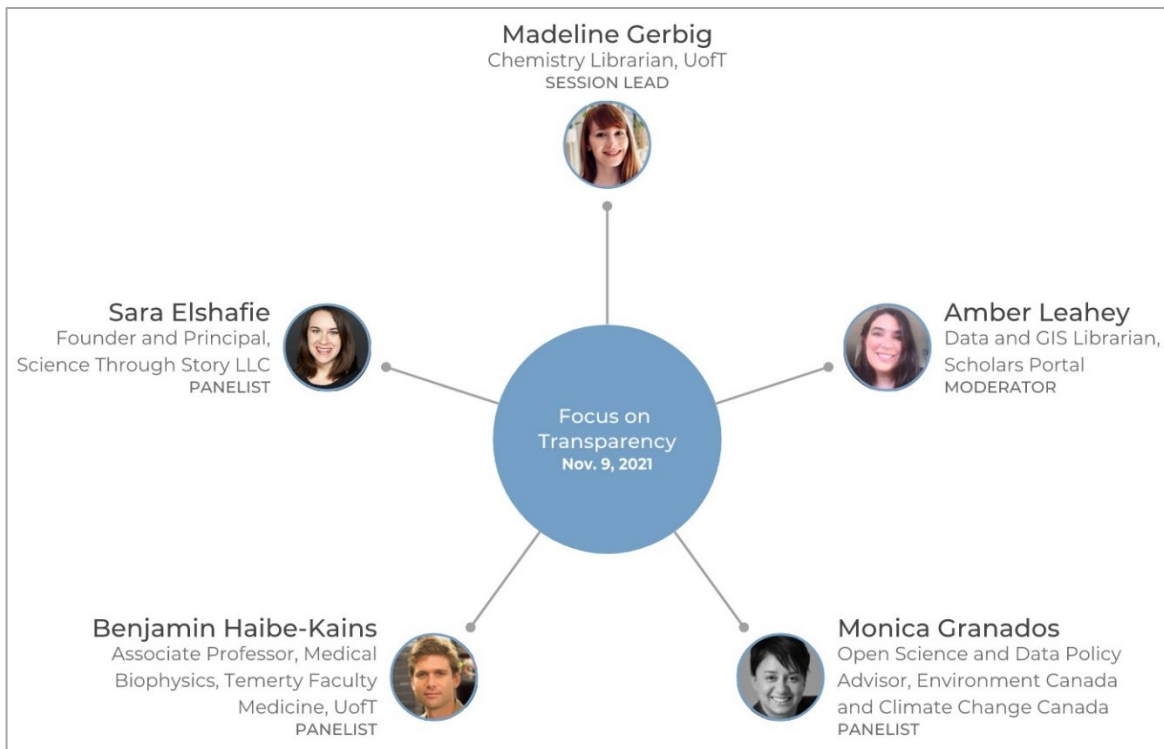


Figure 3: Focus on Transparency

In this panel, discussions centred around embedding transparency and reproducibility throughout the research lifecycle, from the generation and funding of new ideas to the mobilization of research findings. It also addressed the incentives around transparency and open science, the tensions between transparency and commercialization, and how transparency can improve the public's trust and engagement in science.

Focus on Inclusiveness Panel

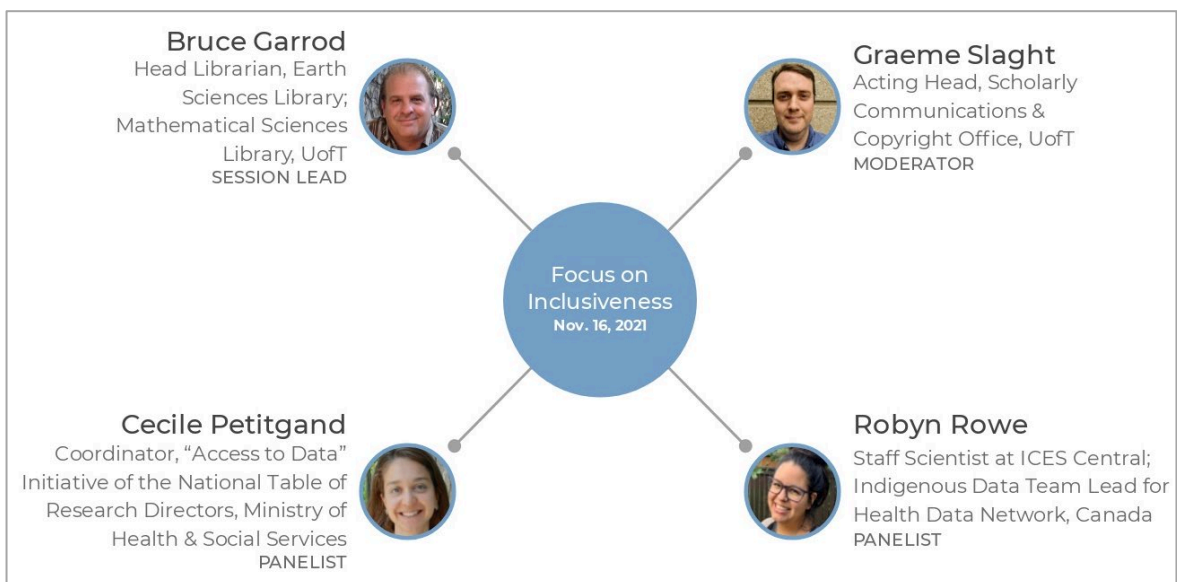


Figure 4: Focus on Inclusiveness

In this panel, discussions included the right for historically excluded and marginalized groups to participate in science, and on inclusiveness/democratization of open data and who has the right to maintain, control, protect, and develop intellectual property.

Focus on Collaboration Panel

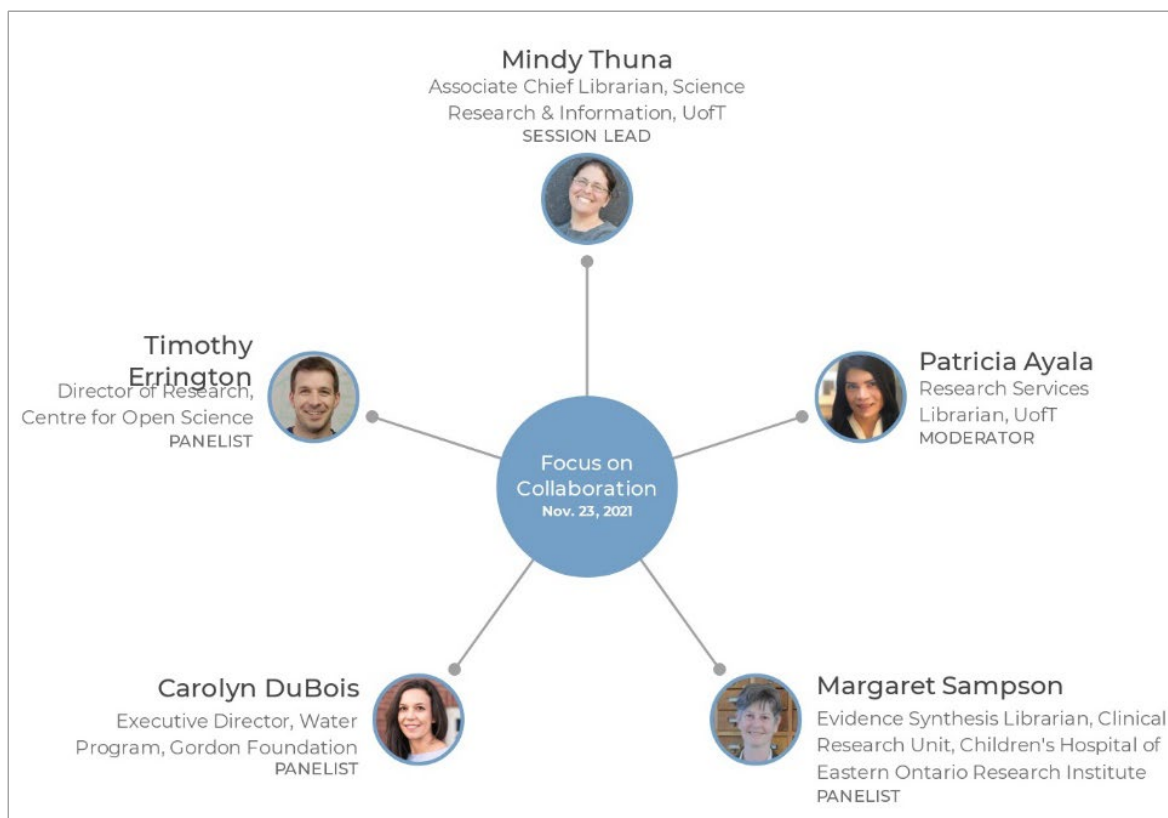


Figure 5: Focus on Collaboration

In this panel, discussions were around key barriers to success of open science collaborations – two highlighted ideas were trust and the need for flexibility to meet people where they are, rather than aiming for a one size fits all approach.

Focus on Sustainability Panel



Figure 6: Focus on Sustainability

In this final panel, discussions on the importance of equity, inclusion, diversity, and justice – the need for global participation – in any talks around sustainability were brought to the fore. Discussions also focused on changing funding mandates so that authors are not caught between publisher's policies and funders by encouraging deposits into institutional repositories; embargoes and expensive article processing charges (APC); and how publishers are being sustained in the current system by exploiting the knowledge producers. There were also discussions on defining 'sustainability' and what systems need to be sustained; the use and support of open source publishing platforms, such as Public Knowledge Project (PKP) and Open Journal Systems (OJS), and the need to restructure conference publication models.

3. Conclusions

This word cloud presents some of the common themes that emerged throughout the series.



Figure 7: Word cloud with common themes throughout the series

3.1 Challenges

For those who have been involved in organizing events, the following challenges will be familiar:

- Low registration numbers - this could be due to November being a busy time of the year in academia
- Coordinating and scheduling all the meetings were a challenge due to everyone's schedules and the different time-zones
- Lower faculty participation in the panels than expected
- Low response rate to feedback survey for each panel

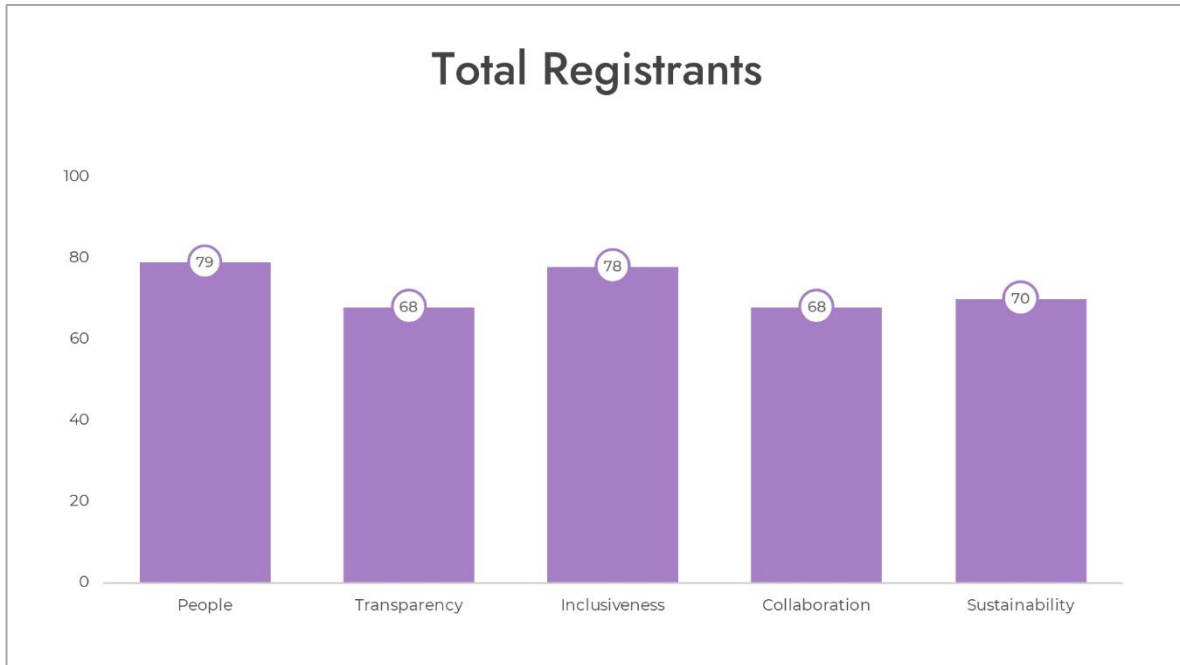


Figure 8: Total number of registrants for each session

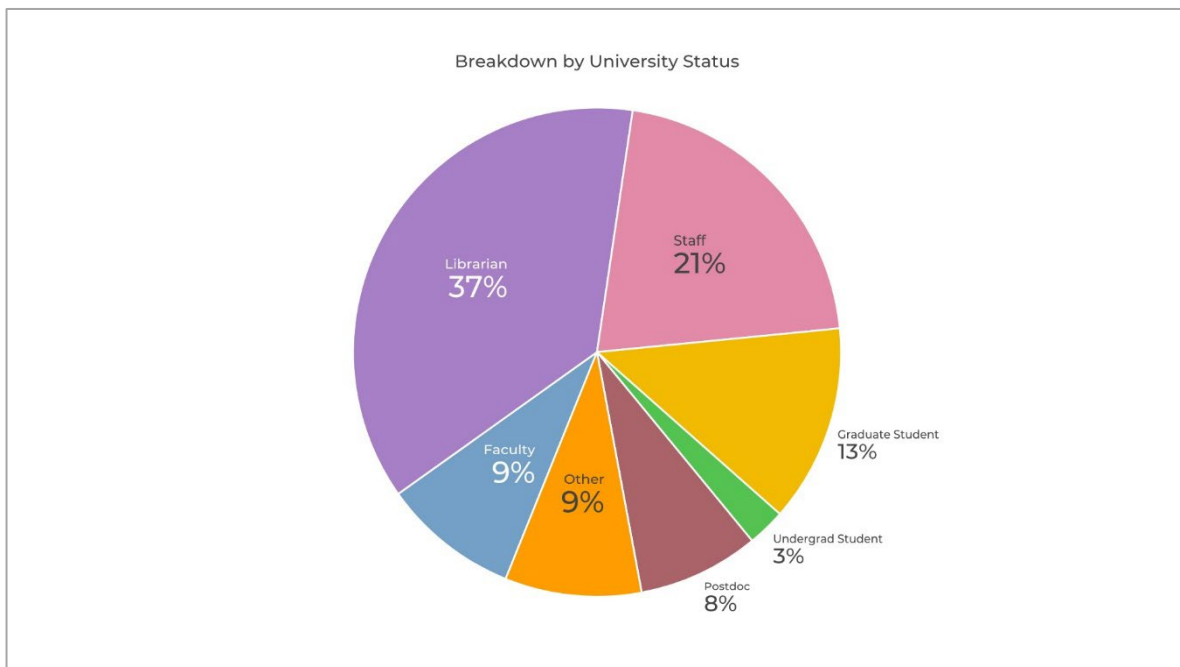


Figure 9: Breakdown of total registrants by their university status

3.2 Positive Outcomes

There were numerous positive outcomes:

- Panelists and moderators were very pleased to be invited to speak. There was a high acceptance rate - the only reason a small number declined were due to scheduling conflicts
- Great collaboration and connections that were created, both in putting this series together and afterwards. For example, panelists who were not acquainted with each other prior to being on the same panel, worked together in future events
- The privilege to collaborate with the Chief Librarian & Archivist of Canada
- Energetic librarian participation - librarians felt it was a rightful conversation and space to be a part of
- Informative discussions with the library central to the conversations which was an objective that we were able to meet. Science is done by people, so it was important to have librarians front and centre embedded in all the conversations
- Panels were created with diversity and inclusivity at the core

4. Acknowledgements

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