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Open Science is About People and Processes, Not Just Papers

La science ouverte, ce sont d'abord les personnes et les processus, pas seulement les articles

Cay del Junco
University of Toronto
cay.deljunco@crdcn.ca
https://orcid.org/0000-0002-3743-2208

Wynn Tranfield
STEM Librarian
University of California, Santa Cruz
wynntranfield@ucsc.edu
https://orcid.org/0000-0002-3802-8362

Abstract / Résumé

The Trump administration's 2025 decision to embrace a Biden-era open access mandate invites the question: Are such mandates progressive, as most of us in libraries assume? Free sharing of the products of research, mainly publications and data, has arguably been the most prominent embodiment of the ongoing push for open science (OS). UNESCO (2023) has highlighted equity, fairness, diversity, and inclusiveness as values of OS; these are values that the present U.S. government explicitly opposes. In this commentary, we share a philosophical perspective on OS, introduced by Sabina Leonelli in a 2023 monograph, that provides a framework for understanding the political flexibility of sharing initiatives. Leonelli proposed an alternative model for OS, one that focuses on research *processes* rather than *products*. This model is better positioned to fulfill OS's promise of increasing epistemic diversity in science. We also consider what a process-oriented view of OS would mean for libraries in practice.

La décision prise en 2025 par l'administration Trump d'adopter un mandat de libre accès provenant de l'ère de Biden soulève la question suivante : de tels mandats sont-ils progressistes, comme la plupart d'entre nous, dans les bibliothèques, le croit? Le partage libre des résultats de la recherche, surtout les publications et les données, a sans doute été l'incarnation la plus marquante de la dynamique actuelle en faveur de la science ouverte (SO). L'UNESCO (2023) a mis de l'avant l'équité, la justice, la diversité et l'inclusion comme valeurs de la SO; ce sont là des valeurs que le gouvernement américain actuel oppose explicitement. Dans ce texte argumentatif, nous partageons une perspective philosophique de la SO, présentée par Sabina Leonelli dans un livre publié en 2023, qui propose un cadre conceptuel permettant de comprendre la souplesse politique des initiatives de partage. Leonelli a proposé un modèle alternatif de la SO axé sur le processus de recherche plutôt que sur les produits. Ce modèle est mieux placé pour permettre la réalisation de la promesse de la SO d'accroître la diversité épistémique dans le domaine scientifique. Nous examinons aussi ce qu'une vision de la SO axée sur les processus signifierait concrètement pour les bibliothèques.

Keywords / Mots-clés

Open Science, Citizen Science, Equity, Evidence-based librarianship, Communities of Practice; science ouverte, science citoyenne, équité, bibliothéconomie fondée sur les preuves, communautés de pratique

Introduction

An unusual degree of consensus has emerged in the library world around support for open science (OS) and, in particular, the free sharing of research products — mainly publications and data. In 2025, in the United States, the Trump administration canceled grants that supported efforts to understand and increase diversity, equity, and inclusion. The administration simultaneously pushed to accelerate the implementation of the Nelson memo, which requires immediate open access to federally funded publications and underlying data. When the memo was issued under the Biden administration, it was widely perceived as a progressive mandate. But the Trump administration's embrace of the memo should cause librarians championing OS — even those of us in Canada — to ask ourselves whether OS mandates necessarily advance equity and inclusion in science.

In this commentary, we introduce a 2023 monograph, *Philosophy of Open Science* by Sabina Leonelli*,* that offers one way for library and information professionals to understand the circumstances under which OS efforts may or may not advance stated goals such as "embracing diversity of knowledge, practices, [and] workflows" (UNESCO, 2023, Values section). Leonelli's philosophical perspective is informed by her empirical research about OS practices and her work as a policy advisor for the European open-access publishing initiative Plan S (*Sabina Leonelli*, n.d.). In the

monograph,[1] Leonelli argued that most high-profile OS policies and initiatives are based on a misguided, "object-oriented" view of science. As a result, these initiatives successfully promote the sharing and sometimes reuse of research objects, but they fail to achieve the broader goals of OS, specifically increased *epistemic diversity*. In fact, Leonelli argued that a singular focus on sharing objects can serve to entrench existing hierarchies and reinforce dominant Western and neoliberal norms. She called for a reframing away from an object-oriented approach towards a relational, "process-oriented" approach. She argued that a process-oriented approach would better support epistemic diversity by making the inclusion of diverse perspectives foundational, rather than assuming transparency and sharing will lead to more inclusion.

Libraries are predisposed to focus on objects. They put rhetorical emphasis on the value of sharing outputs to increase the speed, quality, and public benefit of science. Libraries offer related services such as institutional repositories, open-access publishing agreements, and data archiving support. Leonelli's framework encourages readers to consider the affordances and shortcomings of this focus. As we summarize Leonelli's arguments, we reflect on their practical implications for libraries, with a focus on the Canadian OS context.

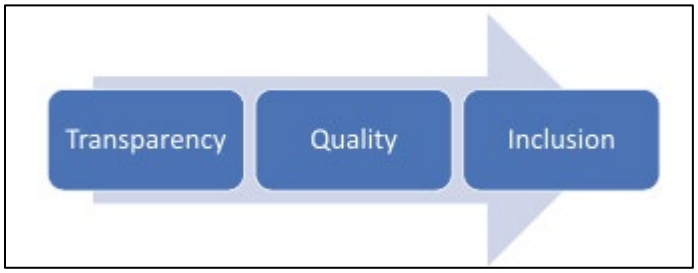
Leonelli's Philosophy of Open Science

Leonelli (2023) described OS as a moving target, subject to shifts in the political landscape, academic labour within institutions, and the capture of science by corporate interests. Corporate interests in science touch the full spectrum of the research lifecycle, but they are most visible in the much-maligned scientific publishing industry. Publisher paywalls are a visible target that has led to a focus "on opening up research as a panacea to … rescue science from commercial and political exploitation, and bring it back to its core values" (Leonelli, 2023, p. 12). Amidst ongoing debate about what exactly these core values are, knowledge-sharing and resource-sharing are values many can agree upon. OS has thus become a refrain organizations use to promote their value to public stakeholders while highlighting their data-sharing and open access policies. Figure 1 illustrates the implied theory of change behind sharing-focused OS efforts.

[1] Leonelli's book was also recently reviewed in the Canadian Journal of Information and Library Science (Wilson, 2025).

Figure 1

The Theory of Change Underlying the Current Dominant Implementations of Open Science that Prioritize Sharing



Note. Leonelli argued that this theory of change is flawed: In practice, transparency does not lead to greater inclusion. Reproduced from Leonelli (2023, p. 19), which is licensed under CC BY-NC 4.0.

However, sharing may not address the misallocation and corporate capture of scientific benefits. The monetization of open access through article processing charges (APCs) is a case in point. Leonelli (2023) described how infrastructures for crop data sharing, which can support research into resilient food systems — essential for everyone in the worsening climate crisis — may exacerbate epistemic injustice in two ways. First, the infrastructures' typical focus on genomic data "systematically devalues information about the local provenance of such objects, including their environmental and socio-economic context" (Leonelli, 2023, p. 25). Second, if the reuse terms are lenient, as OS discourse typically encourages, data-sharing infrastructures can facilitate the extraction and commodification of knowledge from Indigenous and farming communities. This case highlights the need for infrastructures and protocols that support Indigenous data sovereignty (McCartney et al., 2022).

Leonelli (2023) argued that the emphasis on sharing reveals an underlying assumption that science is fully summed up by a set of objects: publications, data, instruments, samples, and so forth. This object-oriented view implies that the unlimited circulation of such objects is sufficient to create better science.[2] As the failures of the model show, this view is both epistemically and ethically insufficient. Leonelli argued that objects are a snapshot of a moment in research, and "their validity, relevance and significance within research thus need to be routinely reassessed and adjusted to the relentless changes within science, the world and human aspirations" (Leonelli, 2023, p. 53). To illustrate this, Leonelli considered the adoption of free, open-source software. Some scientists in less-resourced contexts perceive a stigma around open-source software as a marker of low-quality research. These scientists perceive the use of proprietary software as a tool to facilitate publication in more prestigious journals, even if purchasing the proprietary software is financially untenable (Leonelli, 2023, p. 23). By

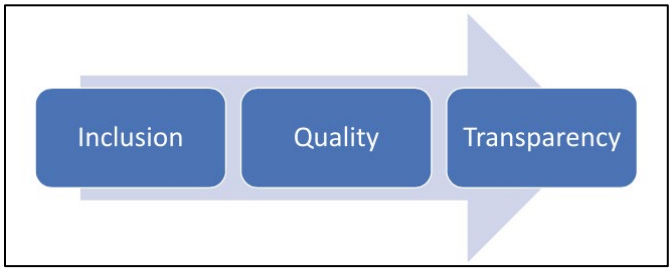
[2] Because of the neoliberal connotations of the object-oriented view, we think *product-oriented* may be another useful framing.

ignoring power dynamics and material differences between research sites, as well as the embodied and contextual expertise central to scientific research, the object-oriented view is destined to fail at the goal of increasing inclusion and to fall short of improving the quality of science (Leonelli, 2023, p. 15).

According to a recent study of OS policies, most top-down initiatives and policies that libraries support focus on object-oriented sharing, even when they mention diversity and inclusion (Chtena et al., 2025). The authors stated that Canada's federal Open Science Roadmap "mentions public engagement third among its justifications for OS, yet its proposed actions focus almost exclusively on OA [open access], OD [open data] and scientist-to-scientist communication, reflecting a top-down approach that prioritizes institutional reforms over grassroots engagement" (Chtena et al., 2025, p. 14). Similarly, in the United States, the Office of Science and Technology Policy (2023) defined OS as "the principle and practice of making research products and processes available to all, while respecting diverse cultures, maintaining security and privacy, and fostering collaborations, reproducibility, and equity" (para. 5). However, the implementation of this definition only mandates the sharing of publications and data, and it makes no provisions for more equitable participation in science or access to its downstream benefits. The COVID-19 pandemic revealed the problems with this approach: Fast data sharing may have accelerated vaccine development, but vaccine distribution reinforced the corporate capture of publicly funded knowledge and deepened global inequities in healthcare.

Figure 2

The Theory of Change Underlying a Relational, Process-Oriented Open Science



Note. Reproduced from Leonelli (2023, p. 43), which is licensed under CC BY-NC 4.0.

Leonelli (2023) argued that researchers need to move away from the object-oriented view of openness to a *process*-oriented view. To Leonelli, crop research (among other examples) shows how "research situations can differ from one another" in ways that are "directly relevant to the content and quality of the knowledge being produced" (Leonelli, 2023, p. 28). By attending to the range of different processes of knowledge production and emphasizing process rather than product as the basic unit of OS, Leonelli argued that the process-oriented view, shown in Figure 2, better respects and promotes epistemic diversity in science. Epistemic diversity, in turn, improves the quality of science. In making this last connection, Leonelli drew on feminist philosopher Sandra Harding's concept of "strong objectivity," which emerged from Harding's (1995) argument that everyone's thinking is shaped by their identity and life experiences, and

humans can only achieve objectivity by bringing a variety of perspectives into conversation. In the agricultural data space, process-oriented OS could involve the establishment of communities of practice to develop data-sharing protocols that respect local producers and Indigenous knowledge. Leonelli acknowledged that this approach would be slower and more challenging because stakeholders may be motivated by fundamentally different priorities. But slowing down also has epistemic advantages: It can enable exploration of "which assumptions underpin the ways in which data were generated, and whether such assumptions make sense within new contexts of data use" (Leonelli, 2023, p. 57).

Process-oriented open science in libraries

Leonelli's (2023) work leaves the reader to imagine practical paths forward towards a remodeled, process-oriented OS policy. An important first step is simply to develop awareness that not all technologies and practices marketed as OS have the same potential to support epistemic diversity, justice, and "research aimed at sustaining life on this planet" (Leonelli, 2023, p. 3). But what does this mean for Canadian academic libraries?

In some ways, libraries are poised to promote a process-oriented version of OS. Their cross-disciplinary work gives them an appreciation for methodological diversity within and across disciplines and positions them to support the design of sharing infrastructure that can accommodate a variety of research paradigms. Additionally, library workers' ongoing focus on critical information literacy aligns with teaching researchers to question the ontological assumptions behind tools. However, in line with the library's history as a book repository, most libraries support an object-oriented OS model: Libraries administer institutional repositories for sharing publications, create metadata schemas to standardize research outputs, and advise researchers on meeting grant requirements for open-access publication and data sharing. These modalities are encouraged by Canadian federal OS policy, which, according to librarians Chantal Ripp and Maddie Hare, focuses on an "output-centric approach" at the expense of "the transformation of processes and practices, such as citizen science" (Sherriff et al., 2026).

There are good historical and policy reasons for the current object-oriented approach to OS support, but aspects of it may not serve libraries' broader goals, such as research quality, sustainability, and the public good. Two recent reviews assessed the evidence for academic (Klebel et al., 2025) and societal (Cole, 2024; Cole et al., 2024) impacts of OS practices. In the academic sphere, the authors found some evidence for seemingly positive impacts of object-oriented OS practices like open access, such as decreased time to publication thanks to preprints, but increased efficiency may not benefit science as a whole. Other research has shown that despite a ballooning number of research objects, the progress of knowledge is stagnating (Bloom et al., 2020; Chu & Evans, 2021; Park et al., 2023). Moreover, weighed against the slim benefits to academics are negative societal impacts, including the exacerbation of inequities due to the APC model and unequal access to Open and FAIR data (Cole et al., 2024). Cole et al. (2024) noted that an absence of evidence for impact is not evidence of the absence of impact.

However, as the open access movement enters its third decade, libraries should ask how they might channel their OS efforts towards practices with demonstrated societal impact.

The practice with by far the most evidence for societal impact is citizen science (CS), a process-oriented intervention that changes scientific methods by explicitly including a wider public in the process. Notably, the documented impacts of CS result mostly from the act of participating rather than the outputs (partly due to the continued exclusion of citizen-science results from decision-making). Citizen scientists have reported increased self-efficacy, leadership, and knowledge (Cole et al., 2024). In other words, the current impacts of CS stem from the process rather than the product. Moreover, some types of CS aim to serve community needs rather than produce peer-reviewed papers: alternative outputs could include an app for environmental reporting by and for locals, as in the case of the Pollution Reporter Mobile App developed by the Technoscience Research Unit in collaboration with Aamjiwnaang First Nation (Environmental Data Justice Lab, 2026). This example shows that the most impactful OS projects may not produce traditional scientific objects at all.

In Canada, federal funders are recognizing the value of process. In 2020 the Tri-Agencies signed the San Francisco Declaration on Research Assessment (Canadian Institutes of Health Research, 2020), which calls for a shift away from quantitative research impact metrics, like citation counts, towards a more holistic approach that acknowledges the value of many contributions, including “working in partnership with various sectors of society” (Canadian Institutes of Health Research, 2020, para. 4). Considering these three factors — the ways that sharing has failed to live up to its promise, the emerging evidence about the impact of different forms of OS, and the stated direction of federal policy — it may be valuable for libraries to broaden their OS support in order to focus more on process-oriented OS.

Given the evidence for the societal impact of CS, Canadian libraries might consider investing in this area. Our environmental scan of CS-related content on Canadian academic library websites suggested this is a mostly untapped area of support. International initiatives could serve as examples. In Europe, the Association of European Research Libraries (LIBER) CS Working Group recommended examining existing infrastructure and thinking creatively about how it could be leveraged for CS (Wallis et al., 2023). For example, as experts in metadata and data management, library workers could support the discovery or design of metadata schemas to facilitate decentralized data collection, which is common in CS projects. Librarians could also provide training in software versioning and preservation for open-source projects.

The University of Victoria (UVic) Libraries are investing in process-oriented OS through their Kula: Library Futures Academy initiative. Kula contributed seed funding for the Open Science Community of Victoria (OSCV), founded by UVic librarian Monique Grenier as a branch of the International Network of Open Science & Scholarship Communities (UVic Libraries, n.d.). The OSCV focuses on skill building, exchange, and collaboration and “seeks to foster a research culture that is inclusive … and community driven” (Grenier, 2025, para. 2). Another initiative of Kula is to secure funding to build a

central repository of CS projects. The short-term goal is to increase the visibility of CS projects at UVic and the projects' impact on local and international communities. Library workers would then approach the coordinators of these projects to learn more about how the library could support their needs. Christian Schmidt, the strategic initiatives coordinator at Kula, said the goal is to promote a big-picture view of OS as knowledge democracy and not just papers and data. In this spirit, he wanted to see the library provide support to CS projects that don't live within a university: "How can we be enablers of the work in the community, even if the citizen science projects don't give us any artifacts?" (personal communication, April 23, 2026).

It's important to emphasize that there is no clean mapping between object-oriented OS paradigms and open access/open data, nor between process-oriented OS and CS. Our goal isn't to designate some types of OS as bad or good. As many have noted, CS can be extractive when it relies on laypeople solely for labour, without inviting them to help shape the conception, goals, and outcomes of research. This approach focuses only on the *objects* that citizen scientists can provide to the project (Hall et al., 2024). On the other hand, open access and open data infrastructures are still needed for process-oriented OS. As the LIBER CS working group suggested, libraries don't need to move away from their focus on infrastructure and preservation. Instead, they can leverage these strengths and knowledge bases to support more relational modes of OS. The careful, collaborative development of much collective library infrastructure, such as OCUL's Scholars Portal, offers a model for how to prioritize process.

Leonelli (2023) pointed out that "there is always a decision made around who will benefit and who may lose out from specific research initiatives, and the more explicit and reflexive that choice is, the better" (p. 59). Libraries constantly make decisions about where to invest limited collections budgets, usually based on volume of demand. What would it look like for libraries to prioritize more relational forms of OS? It could mean adopting a strategic priority to advance relational forms of OS that foreground epistemic diversity. Librarians could develop rubrics, like those used in collection development, to make decisions about support based on the alignment of specific OS initiatives with the strategic priority. In the spirit of process-oriented OS, library workers would have to engage with researchers on campus and beyond to understand their needs, rather than seeking to offer one-size-fits-all support.

Conclusion

This is a tenuous time for researchers and librarians, most visibly in the United States, but also in Canada. We are entering an era of austerity in public universities and colleges, spurred by provincial and federal policies including anti-immigrant limits on international student visas. Such times encourage conservative thinking. Yet, as embedded institutions concerned with epistemic diversity and the public good, libraries must continue to reassess priorities and adapt support infrastructure in order to leverage limited resources to promote meaningful openness. We suspect there are many examples of this happening within academic libraries, in both quiet and loud ways. A growing, national, open science community of practice, including new fora such

as the Canadian Open Science Conference, will help surface these examples. We are excited to continue the conversation.

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