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2nd Open Science Conference

In Praise of the “Great Open Conversation of Science”

A summary of key messages from the
2nd United Nations Open Science Conference
21–23 July 2021



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Introduction

On 21–23 July 2021, the UN Dag Hammarskjöld Library and the UN Department of Economic and Social Affairs, Division for Sustainable Development Goals held the 2nd global Open Science Conference, *From Tackling the Pandemic to Addressing Climate Change*.

The three-day virtual Conference brought the global discussion on Open Science and climate action to the United Nations Headquarters and highlighted national and intergovernmental policies, and Open Science initiatives from around the world. In cooperation with the global open scholarship community, the Conference also engaged with early career leaders working to advance openness in research and education at a time of lockdowns and invited them into conversation with established leaders and policy makers in national science policies.

Since 2019, when the Dag Hammarskjöld Library held the first Open Science Conference at the United Nations Headquarters in New York, the global open movement has been significantly enriched with new national and international policies and frameworks as well as daring and visionary initiatives, both private and public. The roundtable discussion among 19 eminent personalities in Open Science that preceded the Library’s 2019 Conference had resulted in a document of principles elaborating on the necessary elements needed for the creation of a global Open Science Commons for the Sustainable Development Goals (SDGs).

During the pandemic, the component of openness in the scientific process achieved criticality. A joint appeal for Open Science was launched by UNESCO, WHO, CERN and the Office of the United Nations High Commissioner for Human Rights. Research and funding institutions, libraries and publishers switched content to open access, in some cases overnight, to ensure researchers and citizens could easily obtain scientific information, solidifying a tacit understanding of Open Science principles. Sharing of scientific data during the global COVID-19 crisis has indeed been unprecedented. Increased funding for applied research took the lead in the biomedical sciences, and the global community concentrated on the medical aspects of defeating the pandemic. On the other hand, the societal impact of the pandemic and the replication of existing social and economic inequalities could have been avoided and excluded from the modeling used to tackle the public health crisis and the vaccine distribution. The interdisciplinary nature of research and the prism of intersectionality could have ensured a more holistic approach to the research the planet needs in our rapidly digitalized and data-driven future.

The Conference seized the opportunity to take stock of actions undertaken nationally and internationally, collect lessons learned and identify directions for the way forward. Over the course of the three days of the conference, a large audience participated lively in a global online conversation that recognized the challenges ahead. Open Science was recognized as the keystone to assert everyone’s right “to share in scientific advancement and its benefits”¹. Speakers and audience asked for the complete overhaul of outdated scientific processes, publishing and research assessment practices that oppose Open Science principles, proposed global curation infrastructures for the record

¹ Article 27, Universal Declaration of Human Rights: <https://www.un.org/en/about-us/universal-declaration-of-human-rights>

of science and platform-agnostic discovery services, as well as enhanced bibliodiversity², inclusivity, and multilingualism.

This document offers a brief outline of the main ideas, opinions, and suggestions put forward by the Conference speakers and audience members. It is complementary to the video recordings and presentations which are freely available online³. In collecting these key messages, I’d like to express my gratitude to Ms. Astra Bonini, Mr. Geraldo Gonzalez, Ms. Cynthia Lully, Ms. Ariel Lebowitz, Mr. Elhadji Mansour Ba, Ms. Jennifer Maston, Ms. Elizabeth Mwarage, Ms. Lauren Juskelis, Mr. John Gillespie, Ms. Janine Pickardt, Ms. Catherine Pysden, and Ms. Lana Zaman. These colleagues all join me in sincerely thanking our 32 speakers and 7 moderators for their outstanding interventions. This collection of insights would not have been possible without them, nor without the lively discussions held with colleagues from all over the world who participated online.

New York, 11 October 2021

Thanos Giannakopoulos, Chief Librarian
United Nations Dag Hammarskjöld Library

² Bibliodiversity refers to incorporating not only papers and articles, but also books, reports, proceedings, and other documents.

³ Please visit: <https://www.un.org/en/library/OS21>.

1. Global multistakeholder consultation for Open Science

The opening keynote clearly placed Open Science in the role of an accelerator of the Sustainable Development Goals (SDGs) and stressed the need for scientific humanism: “By making science more connected to societal needs and by promoting equal opportunity for all, Open Science can be a true game changer in bridging the science, technology and innovation gaps between and within countries and fulfilling the right to science (article 27 of [Universal Declaration of Human Rights](#)).” The moral imperative of the SDGs to leave no one behind must also apply to the scientific process. There are millions of people dying from treatable diseases because they do not have access to the benefit of scientific and technological advances due to their circumstances. This became painfully apparent with vaccine inequality.

UNESCO’s global consultations and the large Open Science Partnership led to the [Recommendation on Open Science](#) that was negotiated at the Intergovernmental Meeting of Experts in May 2021 and planned to be put forward for adoption at the UNESCO General Conference in November 2021. The Recommendation is an international standard-setting instrument that addresses research quality and integrity, capacity building, infrastructure, alignment of incentives and the revision of criteria for evaluation, intellectual property rights, links with indigenous knowledge systems, international solidarity, and the risks of commercial monopolization of research. It delivers a common definition for Open Science, “an inclusive construct that combines various movements and practices”, it includes all scientific disciplines and aspects of scholarly practices incorporating basic and applied sciences, natural and social sciences, and the humanities. It offers a framework of values and principles and a clear set of actions that can help all stakeholders – and most importantly world governments

– to develop and implement policies. Dr. Shamila Nair-Bedouelle, Assistant Director General of UNESCO, concluded that Open Science requires a profound shift in the scientific culture, changing from competition to collaboration, manifesting respect towards the diversity of cultures and knowledge systems. We do need scientific humanism in this troubled world.

2. Policymakers for Open Science

There is a strong common motivation to share knowledge to improve human well-being, to build capacity to tackle global challenges and to build resilience against current and future crises. The pandemic brought the need for Open Science in the benefit of the public to the foreground, at the same moment that UNESCO was concluding their extensive and comprehensive consultation process for a recommendation to UNESCO Members States on Open Science. The opening day panel discussions explored different national and regional policies implemented around the world that are paving the way for the culture of science to change. While the pandemic showed that Open Science can accelerate discovery, it also highlighted the need to upgrade the infrastructures to deal with the flood of new information to support this research ecosystem with rigor and (re)build trust in science. Traditional publishing models are not designed to respond to public emergencies; a fact tacitly admitted when access to COVID-19 research was swiftly changed to open at the beginning of the pandemic. The sequencing of the COVID-19 genome published in an open access journal was a first, and there is now a greater understanding of the need for timely sharing of knowledge and data that regular scientific publishing cycles do not meet.

It was reiterated that there are substantive technical challenges in sharing data which need to be anticipated to respond faster to the next crisis; national

policies alone will not suffice in the face of the climate crisis, and global cooperation is a necessity. While there have been many positive moves toward Open Science, it has not yet become the new normal. It is still a minority of studies that make data openly available; less than 50% of clinical trials publish their data. Studies and research that were open during the pandemic, may not remain open for long and there is evidence that some have already been sequestered behind paywalls, which raises some concerns as we have not yet overcome the COVID-19 crisis. This indicates that terms are still being dictated by service providers, and not the users. A common theme that emerged: it is not just the final product that needs to be open, but the whole life cycle of the research process which must be and remain open, interoperable, based on the principles of equity, security, and trust. The creators of the Web at CERN did not patent it, and this allowed the world to benefit from it.

The pandemic forced the global community to confront their inertia for change and to consider a future that looked very different from the present. Daily routines, supply chains, travel – all were interrupted which had an impact on the average citizen. While the world’s scientists raced to figure out the virus and governments made policies based on what was known at that time, the pandemic escalated the flood of misinformation and fake science, causing mistrust towards scientific discovery. A public health crisis became polarized, and science was undermined in perilous ways. In concert with Open Science, there needs to be an investment in “translating” complex scientific findings, repackaging them for different communication channels and audiences. To help stem the tide of the infodemic, researchers must work on communicating science better and governments must work to re-establish trust and transparency on science-based policy and decision-making.

3. Science, Open Science, COVID-19, and climate change

Professor Geoffrey Boulton brought the conversation on Open Science back to the scientists. The keynote explored the history and traced progress of Open Science, the context we find ourselves in today, and the challenges and opportunities. The goal must be to ensure decisions are made based on evidence for the advancement of human well-being and to find a sustainable path forward as we face climate change, pandemics and other global crises.

The traditional self-organizing model of science comprised of governments, funding agencies and universities motivated by the public good for scientific research, led to academic freedoms that enabled broad spectrum advances based on the curiosity and ingenuity of the researchers. For Open Science to be realized, a similar self-organizing model is necessary. Reform to the current dysfunctional market of research assessment largely based on proxy measures controlled by commercial publishing corporations is essential. If we do not change scientific publishing, we will not change behavior, and Open Science will remain a dream.

As per UNESCO’s Recommendation, it is the scientists who will have to help with the implementation. Open Science does not change the fundamentals or rigors of the scientific process; however, the social aspects of science and the public benefit of science are changing with the digital revolution and the new means of communication and dissemination. The pandemic was a stress test for science that demonstrated the capacity of international scientific community to mobilize in a crisis. It showed there was a role for scientists outside of publishing papers, a role on the front lines where they were needed to explain their work to the public and share their knowledge and analysis in ways that speak to individual circumstances.

Reform to the research assessment system is urgent. We need to normalize crucial aspects of science communication such as pre-prints, overlay reviews, open licenses, and citable data publication. Bibliometrics need to fundamentally change in the research assessment process and transition to Open Science metrics; indirect proxy measures currently used (impact factors, university rankings, citations indices) are not a direct measure for the thing they stand for. As Goodhart’s law suggests, if a measure becomes a target, it ceases to be a good measure, because when applied to people and not things the measure can be and is gamed. We need to implement novel peer-review, platform-agnostic discovery services, and global curation of infrastructures for the record of science. We need to establish governance processes within the scientific community, to establish incentives from bibliometric to Open Science, adhere to the principle of globally inclusive / nationally efficient, and employ distributed functions / common standards. As WHO’s Robert Terry mentioned, “the print journal is dead, and if it is not, it should be”. Despite the many lessons learned on Open Science from the pandemic, there is no silver bullet for complex international issues; there is no vaccine to address climate change.

4. Strengthening the science-policy-society interface

Strengthening the relationship between science, policy, and wider society, known as the science-policy-society interface, is essential for resolving global challenges like the COVID-19 pandemic, achieving the Sustainable Development Goals (SDGs), and meeting the commitments of the Paris Agreement on climate change. Speakers focused on how open access to knowledge can strengthen this

interface by promoting open dialogue and engagement among social actors, enabling the wider sharing of knowledge and resources, and making research and data collection more transparent. At the same time, the rapid and open dissemination of science has varying results in terms of strengthening or weakening trust in science with subsequent impacts on how science informs policy. Incorporating ethics and integrity in the scientific process, the development of digital trust, privacy protections, and work to build bridges between civil society and governments can enhance trust. Other proposals around Open Science for a stronger science-policy-society interface included: innovating data reporting mechanisms to better connect people with data and to ensure data interoperability; enhancing collaboration between researchers and end users to boost participatory science; improved response mechanisms to improve science and data; efforts to shift incentives towards research that adds public value as with vaccination research during COVID-19; open source repositories that attract good data and content; collaboration between state and non-state actors; and enhanced digital trust policies.

5. Equity in open scholarship

The choices we make in the transition to open system infrastructures for sharing knowledge will affect how equitable Open Science systems will be in the future. Speakers explored the ways in which values like power, greed, exploitation, profit, and expansion result in climate change, racial/class/global inequalities, and systemic oppression that excludes historically marginalized groups. The recent inequities in global health outcomes and vaccine inequality are an unfortunate reference. Institutions can work towards equity by adopting values

based in humanities, examining the ways in which solutions might repeat systemic oppression, and centering and empowering vulnerable populations *during* the solution creation process, not after. Social sciences modeling cannot be excluded from statistical analysis employed to produce public benefit programmes. Open Science can contribute to equity only if it enables historically marginalized people to learn about and research topics that are important to them and their communities, have their research recognized and rewarded – not through proxies –, and translate this into impact for their communities. Proposals for increasing equity in Open Science include removing barriers to access and publication of scientific papers, lowering language barriers, openly sharing unique collections, centering the voices of the most vulnerable, including practicing the CARE (Collective Benefit, Authority to Control, Responsibility, and Ethics) Principles for Indigenous Data Governance. Speakers shared two use cases in the context of the climate change crisis: the LICCION-Oblo (Local Indicators of Climate Change Impacts Observation Network) incorporation of CARE Principles to ensure indigenous ownership of knowledge, and the effort to BBB (Build Back Better) after the tragic burning of the University of Cape Town’s Jagger Library. We were reminded that only when we build social justice in the Open Science infrastructures can we have a truly equitable system.

6. The “Great Open Conversation of Science” in service to humanity

The essential purpose and process of scientific knowledge creation came into focus, summing up the purpose as “service to humanity” and the process as a

“Great Open Conversation” that cycles between two phases: communication (discovery) and publication (justification, selecting out the “not good” through rigorous processes).

With this understanding of publishing as a vital part of the process of the creation of knowledge whose purpose is the service to humanity, Professor Guédon demonstrated in the keynote how these purposes and priorities contrast with and can be hindered by those commercial publishers may have, as well as those of the prevalent ranked-journal-based publishing model. “Platform power” was highlighted – with a special reference to libraries and funding institutions coalition –, as was the potential and possibilities for Open Science publishing that “take the opportunity of the advent of the digital age to shape scientific publishing anew, this time around suitably-designed public platforms.”

6.1. Open Science publishing is much better suited to the purpose of creating good knowledge in the service to humanity than traditional publishing

Currently scientific publishing is market-based and serves the purpose of bringing profits to certain actors, particularly corporate publishers. The current set of rules in this market (journals, impact factors, H-index etc.) is designed to create and maintain hierarchies, force competition, and generate profit for publishers. COVID-19 is a perfect example of how these rules get in the way of scientific knowledge creation in service to humanity, because so many of the rules had to be transgressed to swiftly produce vaccinations and scientific knowledge needed to fight the pandemic. In this situation where the urgent priority of service to

humanity was very clear, there was no place for the market-based rules and priorities of traditional publishing.

6.2. New means of research assessment are needed to better align with and support the purpose of good knowledge creation in service to humanity

Publishing processes are essential for “selecting out” knowledge claims based on scientific methods and justifying what remains as good scientific knowledge. The current “game” of journal ranking, impact factors, and competition has nothing to do with knowledge and in fact gets in the way of the “Great Open Conversation” that is needed for scientific knowledge creation. The current model also creates and reinforces hierarchies and economic, language, and cultural barriers. Moving beyond the journal publishing model into a networked platform model would facilitate worldwide access to research as well as scientific publication from more diverse researchers.

6.3. Potential synergies and strategic alliances

The true purpose of publishing processes is to support the creation of scientific knowledge and not to provide financial gain for publishers. It was questioned that even open access initiatives often take it as a given that the financial “sustainability” of the publishers is an essential priority in the development of any solutions. While the commercial publishers have a lot of financial power to lobby to keep the system as is, Professor

Guédon suggested that libraries and research funding agencies can make a particularly formidable alliance if they work together to disarm the power of the corporate scientific publishers and create new processes of publishing – not only because together they control the majority of the funds that currently go to publishers, but also because of the power and potential they hold for development of policies, technologies, and networks needed to re-open the “Great Open Conversation of Science”.

7. Academia, research, and Open Science infrastructures

The COVID-19 pandemic has made clear the interconnected nature of the systems behind research creation and of the platforms on which this research circulates; it was these transnational systems that allowed us to tap into our collective global capacity in the throes of the pandemic. Speakers warned that the current science system, rooted in proxy metrics, breeds non-collaborative practices, a quality and replication crisis, expensive commercial publication markets, while widely encouraging short-termism, and risk aversion, novelty and quantity over quality, relevance, and impact. In the current reward system in science, society is largely absent from the credibility cycle; a cycle painted with hypercompetition for limited funds, too little room for team-science, most papers still behind paywalls, data not shared, and quality defined in purely quantitative terms (number of articles, journal impact factor, citations, H-index, amount of funding obtained). For science to better reflect societal needs, Open Science principles must be applied to increase the quality, progress, and scientific and societal impact of research and scholarship. This can be achieved through

changing incentives and rewards to better engage with relevant and representative stakeholders, to define problems and discuss ongoing research, share results throughout the work life cycle, and publish openly accessible research results. Such work is already underway in Africa, Europe, Latin and North America. For example, with the pan-African project AfricaConnect in place since 2011 and three regional networks – ASREN, WACREN, and UbuntuNet Alliance – that continue to grow, African libraries are now joining the cause through LIBSENSE (Libraries Support for Embedded NREN Services and E-infrastructure) which is an effort to foster collaboration between libraries and research networks.

7.1. The Latin American model of Open Science

The road to Open Science in Latin America was spearheaded by a framework of openness and sharing developed since the 1950s. This model can offer lessons for other national and regional frameworks currently in development. The Latin American road included national information systems such as national scientific agencies, mega-universities, public universities with large libraries, documentation centers and professional librarians. It incorporated regional networks, digital libraries, and indexing systems such as Bireme (1967), CLACSO (1967), LATINDEX, SCIELO, REDALYC, and BIBLAT. It included national laws on open access – Argentina (2013), Peru (2013), Mexico (2014), Uruguay (2013) –, a result of the first round of Current Research Information System (CRIS) projects, a regional repository federation (LA Referencia), and a regional tradition of university branching. The Latin American approach ensures community-owned and -governed open access to

research outputs (bibliodiversity+), multilingualism, the highest percentage of open access adoption in scholarly journals published, no article processing charges (APCs) and no outsourcing to commercial publishers, university leadership of open access, open access journal and research data platforms, institutional repositories and national and transnational open access policies, prioritizing open access repositories, and co-production of knowledge with other societal actors.

Representatives from CLACSO highlighted the need to promote an Open Science that is community-led in non-profit public open infrastructures with no paywalls for participants or beneficiaries. Research outputs must not be limited to so-called “mainstream” global open data and emanate from diverse societal actors. The global dominance of the English language, the monolingualism of scientific output, was raised as a concern for the universal benefit of science. Representatives from LA Referencia⁴ emphasized the work undertaken to give visibility to publicly funded scientific production in Latin America, through a successful federated network of institutional and data repositories.

8. Scholarly communications actors

When borders closed during the pandemic, scientists and librarians increased the sharing of research data to facilitate global collaboration. Publishers provided

⁴ LA Referencia is an open access federation of 10 countries harvesting 790 institutions and journals.

free access to peer-reviewed research on COVID-19 while textbook companies granted universities temporary free access to their electronic collections. Speakers reflected on the successes of Open Science during the pandemic and urged the application of open access principles in the fight against climate change. The redefinition of science as a public good – rather than as intellectual property – is necessary for information to be disseminated rapidly to address global emergencies like pandemics and climate change. To generate a social and cultural shift towards Open Science, speakers encouraged scientists to publish in local open access journals, expand the use of pre-prints and open data and metadata, broaden access to the public and to speakers of all languages, and replace journal-level indicators of prestige with new incentives like social relevance. Investment in infrastructure and the creation of economies of scale will be crucial in generating the human, information technology, and data management resources and capital necessary for such a change. Moving away from the traditional publishing system to one led by academia would be a good beginning. It is the large corporate publishers however who can easily adapt to new standards and requirements – and, in some cases, such as open data, they are heavily involved in shaping those standards. Smaller scholar-led publishing entities and individual journals struggle, and this is a global problem as well as a fragmented one.

Libraries and librarians play a leadership role in bridging the digital divide, ensuring a more transparent and equitable global science system. North African and Middle Eastern countries recommended similar actions during the Regional Arab Virtual Meeting for Open Science and Research in August 2020, including building a regional culture of Open Science, fostering scientific collaboration, expanding digital infrastructure for Open Science, enhancing Participatory Science, and forming partnerships at the regional and international levels.

All speakers at the Open Science Conference focused on the importance to support the involvement of young researchers in the formation of Open Science policies and everyday practices – for the latter, libraries and librarians can assume a leading role.

9. Conclusion: Open Science for the Sustainable Development Goals

Science can be harnessed as a tool for advancing progress on the 2030 Agenda and achieving the 17 Sustainable Development Goals (SDGs). This is recognized in the 2030 Agenda which calls for the establishment of a Technology Facilitation Mechanism to advance science, technology, and innovation for the SDGs including through knowledge-sharing in an open access online platform.

During the Open Science Conference, the link between Open Science and the SDGs was a recurrent theme. The science of complexities is the science of the SDGs, Professor Boulton stated. Following from the experience during COVID-19 where scientists and researchers shared data and methodologies in close to real time, speakers at the Conference urged that now is the time to codify the best of what we’ve learned into a policy framework to support sharing of scientific research and knowledge for the SDGs and climate change. Journals and research institutions opted to remove many of the traditional paywalls and barriers to enable successful sequencing of the genome of the COVID-19 virus. While approximately 90% of research papers on COVID-19 were made public, speakers indicated that far fewer papers on climate change are publicly available. Restructuring incentives in academic research to prioritize public good over

economic profit will be critical to promoting Open Science that will help advance the SDGs. This would include ensuring that context-specific science is supported and recognized across groups and regions noting that scientists in many developing regions and from indigenous and minority groups face barriers to both publishing and accessing research. To that end, speakers suggested that language bias in publishing can be a barrier to both accessing and disseminating research. Better translation efforts and greater dissemination of papers in different languages would help eliminate language bias and enable local communities to access and utilize research for public good. Additionally, the distorted nature of research excellence – propagated by an outdated research assessment and awards system – creates enhanced gender asymmetries which need to be addressed.

There were also suggestions to use the SDGs as a motivator for Open Science and knowledge-sharing. While many governments and research institutions have been developing highly beneficial and informative data portals, speakers emphasized that these data portals are a means to an end; for the data to have meaningful impact, we will require targeted solutions to specific problems. In this way, the SDGs could provide a framework that guides Open Science – which can serve many purposes – toward serving the public good. Repositories of information will be a critical part of linking people with science, but it was suggested that more also needs to be done to link the producers of science to each other in the pursuit of such common goals as the SDGs. We need to be intentional in securing a system-wide shift to bibliodiversity, inclusiveness, and multilingualism, better in communicating science and adept in partnerships and in pursuing a science that is of social relevance, for all.

10. Suggested reading

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