OSI POLICY PERSPECTIVES

OPEN SCIENCE ROADMAP

RECOMMENDATIONS TO UNESCO

OSI POLICY PERSPECTIVE 3
JUNE 2020 EDITION
OPEN SCHOLARSHIP INITIATIVE

ABOUT OSI POLICY PERSPECTIVES

The OSI Policy Perspectives series offers broad, common ground perspectives on key issues in scholarly communication. Each report summarizes the current state of a particular issue and what we know about it, and also attempts to articulate the perspectives and lessons of experience from all stake¬holder groups in scholarly communication on this issue (particularly but not exclusively as expressed in OSI conversations) and identify what common ground might exist for building broadly acceptable policy.

OSI is not a democratic body that speaks with one voice on any particular issue. Trying to reconcile the views, intentions, and motivations of all the different actors, communities and groups in the scholarly communication space—which are very rarely entirely aligned—is challenging. We acknowledge, therefore, that these reports may be (and in fact, probably are) an imperfect reflection of the many perspectives and ideas in this group. The fact that these reports sometimes need to be published in a rush, in response to policy commenting deadlines and other pressures only makes this imperfection more likely.

We also acknowledge, however, that OSI often considers a wider range of perspectives than established policy making bodies in scholarly communication, and that our relative strength is showcasing this range of perspectives and noting how they differ, and importantly, how they share common ground. To this end, we hope it is valuable to produce these reports, however imperfect, and share them with the scholarly communication community and beyond.

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ACKNOWLEDGMENTS: Thank you to all OSI participants for creating the body of work summarized in this report. In the creation and editing of this document, special thanks to the authors listed above as well as to Nina Collins and Margaret Winker.

CONFLICT STATEMENT: Hampson is the program director and principal investigator for OSI, which receives funding from UNESCO, foundations, commercial publishers, and individual participants (by way of conference fees). DeSart, Steinhauer, Gadd, Vandegrift, Erdmann and Johnson are also active participants in OSI. In addition, OSI serves UNESCO in an official advisory capacity (see sidebar on page 1). In terms of explicit influence, no OSI funders, including UNESCO, have privileged input into OSI policy deliberations apart from being equal members of the OSI community. OSI has many voices contributing to documents such as this, and endeavors to maintain an inclusive and balanced perspective on scholarly communication issues.

DISCLAIMER: In this report, the authors have attempted to accurately represent the perspective and ideas of OSI participants, alumni and observers. However, it is possible that this attempt is incomplete and/or inaccurate. Any responsibility for errors, omissions and/or misrepresentations rests solely with the lead author. Also, the findings and recommendations expressed herein also do not necessarily reflect the opinions of all authors or contributors, individual OSI participants, alumni, or observers, or any institutions, trustees, officers, or staff affiliated with these individuals.

PRIOR AND OTHER VERSIONS: There are no prior public versions of this document.

CITATION: Hampson, G, M DeSart, J Steinhauer, EA Gadd, LJ Hinchliffe, M Vandegrift, C Erdmann, and R Johnson. 2020 (June). OSI Policy Perspective 3: Open science roadmap recommendations to UNESCO. Open Scholarship Initiative. doi 10.13021/osi2020.2735

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OPEN SCIENCE ROADMAP

RECOMMENDATIONS TO UNESCO

UNESCO is designing an open science plan for review by the UN General Assembly in late 2021, and has requested input from the Open Scholarship Initiative. OSI has worked in partnership with UNESCO since early 2015 to forge a workable, equitable, and sustainable path for improving the openness of all research, not only science. OSI advises that UNESCO follow the open science roadmap recommendations described herein, and that this path culminate in either the outright adoption of OSI's Plan A as UN policy; the use of Plan A as a blueprint for eventual United Nations policy; or the use of these roadmap recommendations and/or Plan A as the foundation for a similar United Nations policy that has the benefit of broader global input.

ABOUT OSI

The Open Scholarship Initiative (OSI) is a diverse, inclusive, global network of high-level experts and stakeholder representatives working together in partnership with United Nations Educational, Scientific and Cultural Organization (UNESCO) to develop broadly accepted, comprehensive, sustainable solutions to the future of open scholarship that work for everyone everywhere. OSI is managed by the Science Communication Institute (SCI), a US-based 501c3 nonprofit charity. OSI serves in an advisory capacity to UNESCO as the agency's Network for Open Access to Scientific Information and Research (NOASIR). For more information about OSI, please visit osiglobal.org.

United Nations
Educational, Scientific and
Cultural Organization

EXECUTIVE SUMMARY

Many organizations are committed to improving the future of open science, and many ideas and policies have been put in place to try to achieve this goal. Yet no single agency is leading the coordination of this effort; there are innumerable ideas about how best to achieve the various goals and outcome; and scientists themselves have not been well represented in most of the reforms to date.

OSI has been studying open scholarship (which includes open science) since late 2014, working in partnership with UNESCO to better understand the broad range of perspectives and understand how the world might be better able to make rapid, sustainable progress toward more open research. The first part of this paper summarizes OSI's findings. These findings come by way of several group conferences, supplemented by five years of online debate and reports involving many of the world's leading experts in scholarly communication.

The general findings of the OSI group are:

- Open scholarship is a tremendously diverse and interconnected space. Reforming it will not be as simple as claiming that open is x, the solution is y, and the path to the future can be enforced by a unilaterally-developed mandate.
- The solutions most likely to work and be optimally effective must be developed by all stakeholders working together.
- There is ample common ground on which the research community can come together to build an effective framework for global reform.

The second part of this paper addresses specific questions from UNESCO about open science. Our general policy recommendations here echo our recommendations from the first part of this paper: Open science is a tremendously diverse and interconnected space, and effectively reforming it is something we must do together, not unilaterally.

OSI's overarching policy recommendation combines these recommendations from parts 1 and 2, and suggests that UNESCO adopt the general open science roadmap described throughout this paper.[1] This map has many contours but is generally defined by three broad characteristics—that the global science community and scholarly communication community should:

1. **EMBRACE** the diversity in this space;
2. **IMPROVE** our understanding of open science; and
3. **PURSUE** our common goals and interests.

OSI's Plan A—which summarizes OSI's five years of investigation in this space—can be an instrument to achieve these objectives, or these objectives can be met in some other way.

If we are guided by our common commitment to broadening and expanding access to knowledge, we can arrive at a collaborative future for open science and open research that is far greater than any single vision pursued alone.

Finally, we must recognize that "open" is simply a means to an end. We should be working together to achieve a better, more just, more harmonious society that open contributes to. This is not solely for science but for all kinds of research; not solely for the world's most privileged researchers but for all researchers and societies everywhere. Our focus must remain on building a future that is as rich, vibrant, accessible, equitable, sustainable and bold as it can possibly be. The specific solutions we employ to achieve open science should further these more noble objectives.

If we are guided by our common commitment to broadening and expanding access to knowledge, we can arrive at a collaborative future for open science and open research that is far greater than any single vision pursued alone.

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1. By "roadmap," we mean a high-level plan that helps articulate strategic thinking, explaining not just why something should be done but the goal and plan for getting there.

PART 1: GENERAL RECOMMENDATIONS FROM OSI'S CONSULTATIONS

In October of 2014, the Science Communication Institute (SCI) convened and moderated a three-month online conversation of around 100 participants to discuss the future of open science. In February of 2015 this group published its findings (see OSI 2015), which included a recommendation to form an international, multi-stakeholder effort to work together on needed reforms in scholarly communication, affecting all of research and not just science. The Open Scholarship Initiative (OSI) was thus born, thanks to early support from the UNESCO and George Mason University.

Over 450 high-level leaders in scholarly communication have engaged with OSI since this time, representing 250 institutions from 27 countries and 18 unique stakeholder groups. These leaders have assessed, analyzed, scrutinized and debated extensive perspectives and information on open research and open science through conferences, summit meetings, dozens of reports, and thousands of emails.

As an organization, OSI's long-term arc has been to work through a 10-year process for reforming the global scholarly communication system. OSI's approach involves not only discussing solutions that work across stakeholder groups and countries but also building a stronger foundational case for open that all stakeholders agree with and support. OSI is the world's only large-scale, high-level, multi-stakeholder effort focused on developing an inclusive, achievable, sustainable approach to global scholarly communication reform.

OSI's first year was devoted to laying the foundation for what we would try to accomplish, and to finding and recruiting top-notch participants from around the world. The second two years—2016 and 2017—centered around fact-finding, featuring two full-group conferences from which numerous papers were published. The next phase—2018 and 2019—focused on action planning.

Today, in 2020, we have a plan—Plan A (see http://plan-a.world)—that embraces the full measure of OSI's thinking over the past five years and lays out a roadmap for how OSI's recommendations should move forward. While we will still collect facts and refine our plans, we have a good idea of exactly what OSI will try to accomplish over the next five years and how. Our hope is that the broad global community will join us in this effort, and that we will also continue to be able help the global community—particularly UNESCO—achieve their open science objectives.

OSI's Common Ground paper is referenced throught this report. It details the case for why common ground solutions are necessary in open scholarship reform. A full and summary version of this report can be downloaded from the OSI website at osiglobal.org.

KEY RESOURCES CREATED BY OSI

- OSI's 2015 report on open science recommending the creation of OSI (Mapping the Future of Scholarly Publishing)
- OSI's 2016, 2017, 2018, and 2019 summary reports
- OSI conference workgroup reports (linked individually later in this report)
- The OSI listserv

- OSI issue briefs (to date, on defining open, understanding how fast open is growing, and predatory publishing)
- OSI's Plan S policy recommendation
- OSI's Common Ground policy recommendation
- OSI's Plan A
- The OSI website

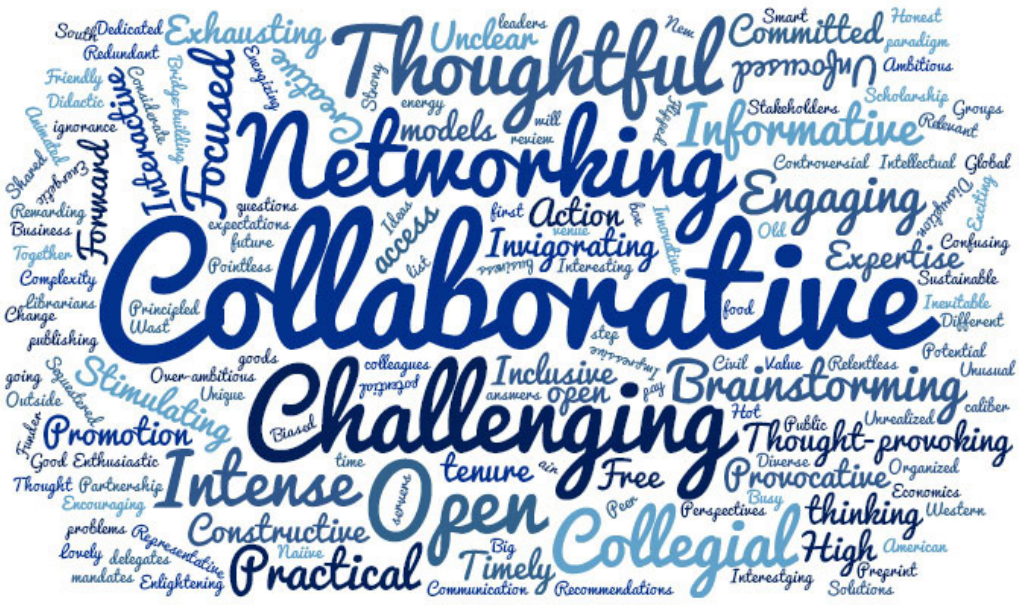
OSI2016 OUTCOMES

The first meeting of OSI delegates—dubbed OSI2016—was designed to address some very broad and foundational questions that underpin this effort. What do we mean by publishing for instance? Who should decide what is and isn't open? What is the moral-ethical case for open? By airing these different ideas and perspectives in a diverse environment filled with high-level decision makers, meeting delegates worked to find common ground on where to begin moving forward together. OSI2016 brought together 190 delegates from 12 countries, 15 stakeholder groups and 182 institutions to answer these questions—including high-level representatives from 50 major research universities, 35 scholarly publishers, 24 government policy organizations, 23 scholarly libraries and groups, 23 non-university research institutions, 17 open knowledge groups, eight faculty and education groups and more. Meeting delegates were assigned to diverse workgroups of 9-13 delegates each and spent most of their conference time debating the answers to these questions:

- **WHAT IS PUBLISHING?** What do we mean by publishing in today's world? What should be the goals of scholarly publishing? What are the ideals to which scholarly publishing should aspire? What roles might scholarly publishers have in the future? What scenarios exist where publishers continue to play a vital role but information moves more freely? What impact might these reforms have on the health of publishers? Scholarly societies? Science research? Why?

- **WHAT IS OPEN?** There is a broad difference of opinion among the many stakeholders in scholarly publishing about how to precisely define open access publishing. Are "open access" and "open data" what we mean by open? Does "open" mean anything else? Does it mean "to make available," or "to make freely available in a particular format?" Is a clearer definition needed (or maybe just better education on the current definition)? Why or why not? At present, some stakeholders see public access as being an acceptable stopping point in the move toward open access. Others see "open" as requiring free and immediate access, with articles being available in CC-BY format. The range of opinions between these extremes is vast. How should these differences be decided? Who should decide? Is it possible to make binding recommendations (and how)? Is consensus necessary? What are the consequences of a lack of consensus?

- **WHO DECIDES?** Tied to this question of who should decide the future of open access, who should have the power to make changes to scholarly publishing practices? Do these powers flow from publishers, institutions, tenure committees, funding agencies, authors, or all of the above? All of the above? None of the above? What are the pros, cons, and consequences of different institutions and interest groups developing and implementing their own solutions (even the one-off variety)? Is federal oversight needed? Global coordination (through an organization like UNESCO)?



Word cloud showing participant reviews of OSI2016. The OSI conferences used a deliberative format modeled after the National Academies Keck Futures Initiaitve (NAKFI) format, where small, diverse, expert groups each tackle a separate topic over the course of several days, then report out to the full group.

- **WHAT ARE THE MORAL DIMENSIONS OF OPEN?** Does society have a moral imperative to share knowledge freely, immediately, and without copyright restriction? A legal imperative? Why or why not? What about research funded by governments? Corporations? Cancer research? For that matter, is our current mechanism for funding scholarly publishing just or unjust? What other models are there? What are the pros and cons of these models? What is the likelihood of change?

- **WHAT ARE THE USAGE DIMENSIONS OF OPEN?** What are the usage-related challenges currently faced by open efforts? For instance, open data is intriguing in principle, but in reality, making underlying data open can be problematic, conflicting with the need for research secrecy (whether driven by the desire to be first to publish, or the desire of funders to hold onto data to protect future discovery potential), the potential for misinterpretation by other researchers, and so on. Publishing clinical trial data in open formats is also intriguing but would run afoul of many current consent agreements, particularly older consents. Open access is similarly challenged in some instances by a conflict between which version of papers is allowed appear in open repositories. What is the value of archiving non-final versions? What are the range of issues here, what are the perspectives, and what might be some possible solutions?

- **EVOLVING OPEN SOLUTIONS.** Are the scholarly publishing tools we're using today still the right ones? Is the monograph still the best format in the humanities? Is the journal article still best in STM? These products can be difficult to produce and edit, nearly impenetrable to read, and—as in the case of clinical research information—they aren't necessarily the best-suited formats for capturing every piece of necessary information (like protocols and datasets in medical research) and showing how this information is all connected to other scholarship. What other formats and options are being considered or used? What are the prospects of change? How about the stakeholder universe itself? How are roles, responsibilities and expectations changing (and where might they end up)? Are we "settling" on half-measures or on the best possible solutions?

OSI workgroups were comprised of nine to thirteen high-level experts, representing a broad cross-section of scholarly communication stakeholder. Workgroups met for a minimum of five hours over two days to debate their assigned topic (in addition to pre- and post-conference discussions), and then presented their findings to the group at the end of the second day and again on the final morning, after incorporating feedback from the full group. Written reports were submitted to OSI within five weeks of the close of the meeting. This is the same deliberative model pioneered by the National Academies Keck Futures Initiative (NAKFI). Pictured here are members of the OSI2016 Usage Dimensions Workgroup, charged with understanding the usage-related challenges of open. Workgroup members from left to right are: Lorcan Dempsey, VP Research, Online Computer Library Center (OCLC); Ginger Strader, Director, Smithsonian Institution Scholarly Press; William Gunn, Director of Scholarly Communications, Elsevier; Chris Erdmann, Head Librarian, Harvard-Smithsonian Center for Astrophysics, John G. Wolbach Library; Amy Nurnberger, Research Data Manager, Columbia University; Stephanie Fulton, Executive Director, The University of Texas MD Anderson Cancer Center; Dee Magnoni, Research Library Director, Los Alamos National Laboratory; Emily McElroy, Director, McGoogan Library of Medicine, University of Nebraska Medical Center; Eric Archambault, President and CEO, Science-Metrix & 1science; and Michael Van Woert, Executive Officer and Director, National Science Board Office, National Science Foundation (NSF).

- **OPEN IMPACTS.** How fast is open access growing? Is this fast enough? Why or why not? What are the impacts of currently evolving open systems? For instance, are overall costs being reduced for scholarly libraries? Is global access to scholarly information increasing? What about in the Global South? What is the impact in this region of increasing adoption of the author-pays system? What pressures is the move to open placing on institutions and systems and what are the costs/benefits?

- **PARTICIPATION IN THE CURRENT SYSTEM.** Do researchers and scientists participate in the current system of scholarly publishing because they like it, they need it, they don't have a choice in the matter, or they don't really care one way or another? What perceptions, considerations and incentives do academicians have for staying the course (like impact factors and tenure points), and what are their pressures and incentives for changing direction (like lowering publishing charges)?

- **INFORMATION OVERLOAD & UNDERLOAD.** Information underload occurs when we don't have access to the information we need (for a variety of reasons, including cost)—researchers based at smaller institutions and in the global periphery, policymakers, and the general public, particularly with regard to medical research. Overload occurs when we can access everything but are simply overwhelmed by the torrent of information available (not all of which is equally valuable). Are these issues two sides of the same coin? In both cases, how can we work together to figure out how to get people the information they need? Can we? How widespread are these issues? What are the economic and research consequences of information underload and overload?

- **PRESERVATION, REPOSITORIES & MANDATES.** Are we satisfied with the current state of global knowledge preservation? What are the current preservation methods? Who are the actors? Is this system satisfactory? What role do institutional repositories play in this process? What does the future hold for these repositories (taking into account linking efforts, publishing company concerns about revenue declines, widespread dark archiving practices, and so on)? Would new mandates help (or do we simply need to tighten existing mandates so they actually compel authors to do certain things)? And how do versions of record figure into all of this—that is, how do archiving policies (with regard to differences between pre-journal and post-journal versions) affect knowledge accuracy and transfer?

- **PEER REVIEW.** Managing the peer review process is one of the major attractions and benefits of the current publisher-driven publishing environment. Would it be possible to maintain peer review in different system—perhaps one where peer review happens at the institutional level, or in an online-review environment? How? What is really needed from peer review, what are the reform options (and what do we already know about the options that have been tried)?

- **EMBARGOES.** In an information system where so much information is destined for subscription journals, the assumption has been that embargoes allow publishers time to recoup their investments, and also allow the press time to prepare news articles about research. Is this assumption warranted? Why or why not? Is the public interest being served by embargoes? What about by embargoes on federally-funded research? Are there any facts or options that haven't yet been considered to address the concerns animating the embargo solution?

Noted education futurist Bryan Alexander (pictured here with university library leader Joyce Ogburn) presents the findings of his workgroup's consulation on information overload and underload at OSI2016. "Information underload and overload are connected," wrote Alexander and other workgroup members in their final report. "The information-overloaded world ironically suffers from under-loading: its inhabitants are incompletely informed, being given too many irrelevant pieces of data that obscure the ones they need. In contrast, information underload is rooted in settings where information either does not exist or is not being supplied; at its core underload is caused by a lack of access and/or an inability to discover information resources even if they are available. As we remedy problems of underload, we create more problems of overload; and as more information is created, supplied, and accessed, the more people without that information are at an underload disadvantage.Information overload and underload both lead to underutilization of knowledge and anxiety. The paradox of choice suggests that more information can lead to its own problems, but this is a problem of great privilege. As more information is created and becomes widely accessible, overload challenges inevitably arise. Still, problems of overload are qualitatively preferable than those of underload. It may be difficult to complete a puzzle with many pieces, but it is impossible to do so if some pieces are missing entirely."

- **IMPACT FACTORS.** Tracking the metrics of a more open publishing world will be key to selling "open" and encouraging broader adoption of open solutions. Will more openness mean lower impact, though (for whatever reason—less visibility, less readability, less press, etc.)? Why or why not? Perhaps more fundamentally, how useful are impact factors anyway? What are they really tracking, and what do they mean? What are the pros and cons of our current reliance on these measures? Would faculty be satisfied with an alternative system as long as it is recognized as reflecting meaningfully on the quality of their scholarship? What might such an alternative system look like?

Groups presented their findings on the final day of the conference, and submitted written reports a few weeks after the conference ended. These reports were published by Mason University Press and are also hosted on the OSI website:

- Preface to the OSI2016 Workgroup Papers
- Report from the "What is Open?" Workgroup
- Report from the "What is Publishing?" Workgroup 1
- Report from the "What is Publishing?" Workgroup 2
- Report from the "Who Decides?" Workgroup
- Report from the At-large Workgroup
- Report from the Embargo Workgroup
- Report from the Evolving Open Solutions Workgroup 1
- Report from the Evolving Open Solutions Workgroup 2
- Report from the Impact Factors Workgroup
- Report from the Information Overload Workgroup
- Report from the Moral Dimensions Workgroup
- Report from the Open Impacts Workgroup
- Report from the Participation Workgroup
- Report from the Peer Review Workgroup

The general themes that emerged from OSI2016 can be summarized as follows:

Acknowledging	Scholarly communication is changing and this change presents opportunities and challenges.
Describing	Some of the change that is happening involves shaking up the current system to utilize publishing tools and approaches that may be better suited to an Internet-based information world. But not all current and needed changes fall into this category. Indeed, some of the most needed changes do not.
Doing (general guidelines for action)	• We don't have a clear, coordinated action plan for improving open. What needs to happen today, tomorrow and the day after? Who are the actors, what are the mileposts, what are the likely impacts, and how do we measure success? (Note that these concerns don't necessary suggest that OSI itself should create and evaluate specific programs of work. Rather, this is a commentary on the need for OSI to identify what it can do and how it will operate, and then farther down the road, what kinds of synergies OSI can encourage.) • Some change will need to involve reforming the communications culture inside academia, where old publishing methods, measures and perceptions can drive author choices and be used as proxies for merit when evaluating grant awards and tenure decisions. And some will need to involve examining our own biases that publishing is a binary proposition involving either open or closed, subscription or APC-based, right or wrong. Open, impact, author choices, peer review and other key concepts all exhibit a range of values. Identifying non-binary measures for some of these values (as proposed by several workgroups) may be helpful insofar as allowing stakeholders to focus on improving areas most in need of change and comparing progress and best practices across disciplines, institutions, publishing approaches, funders and so on. • Any widespread change is going to require a widespread effort. There are simply too many stakeholders with different interests and perspectives who influence different decision points. No single stakeholder or group will be able to affect this kind of change unilaterally. • How do we make these reforms in response to the needs and concerns of authors rather than in spite of authors (authors are not a homogeneous group with common interests or opinions, of course, but there was some sense among delegates that reform efforts could be better attuned to what authors needed)? • How do we make changes across disciplines (which have different needs) and that also effectively build on the efforts of the many stakeholders in this space? • How do we reform the system without losing its benefits? • How do we move from simply repairing dysfunction to creating a more ideal publishing world and reaping the benefits that such a world could provide in terms of participation, efficacy, efficiency, and discovery? • Developing standards and norms would be helpful as we move forward, as well as answers to a number of key questions.

The key recommendations from OSI2016 workgroup reports are listed in the following table. Bear in mind these recommendations are from high-level representatives of multi-stakeholder workgroups. They aren't just hypotheticals, but in many cases are legitimate starting points for conversation that major publishers and research universities may be willing to stand behind:

OSI2016 WORKGROUP	KEY RECOMMENDATIONS
What is publishing 1	Explore disaggregating the current services provided by publishers (such as filtering, editing, dissemination, registration, and so on) and how current scholarly publishing stakeholders might be incentivized to embrace these changes.
What is publishing 2	Explore ways to change the publishing culture inside of academia, including systems of academic recognition and reward. Identify unmet author needs, and gaps in evidence and knowledge, develop disciplinary approaches, and use pilots rather than one-size-fits-all approaches.
What is open?	The scholarly community's current definition of "open" captures only some of the attributes of openness that exist across different publishing models and content types. We suggest that the different attributes of open exist along a broad spectrum and propose an alternative way of describing and evaluating openness based on four attributes: discoverable, accessible, reusable, and transparent. These four attributes of openness, taken together, form the draft "DART Framework for Open Access." This framework can be applied to both research artifacts as well as research processes.
Who decides?	1. Evaluation: Re-assess the criteria for academic tenure and promotion a. Fully consider OA publications on the same footing as all other outlets in research assessment b. Research and validate the use of altmetrics c. Reward greater openness 2. Incubation: Nurture alternative, community-driven publishing models 3. Transformation: Facilitate a "global flip" of research journals from subscription-based to OA.
Moral dimensions	In this transition period, we need to encourage a period of exploration and grace in the search for new models, while being prepared to judge such efforts by the highest moral standards. We must consider, for example, whether a particular invention maximizes the new digital capacity in order to increase universal access. We consider it our responsibility to make judgments about the morality of acts, artifacts, systems, and processes, but not on the morality of people and organizations.
Usage dimensions	1. Perform a landscape assessment of scholarly communication and workflow tools to categorize current best practices, standards and norms. 2. Create an issue brief concerning funder support of open access. OSI should identify conversations that are already happening in this area, looking for synergies and potential partnerships, and facilitate knowledge sharing in this area.
Evolving open 1	1. We need a better understanding of how the system works now. Specifically, we need a comprehensive study that shows in detail, country by country, how funding, tenure, and promotion decisions are made and the role of research outputs and activities within this decision making process. 2. As a community and at a high level, define an ideal future across all issues—peer review, impact factors, etc. 3. Ensure that any new impact system adopted be transparent.
Evolving open 2	1. We recommend that OSI commission the development of a comprehensive set of resources and messaging efforts, targeted to specific audiences, to increase the profile of open access across stakeholder groups. 2. We recommend that OSI appoint a Task Force to develop a strategy for the establishment of an open access venture fund, and deliver a report at OSI 2017. 3. We recommend that the topic of liberating subscription budgets (and the dissolution of "big deal" models) be a future OSI Working Group, with representation from both libraries and publishers. 4. We recommend that an OSI Working Group identify and seek ways to close gaps within the OA infrastructure, beyond STM journals (the lack of developed infrastructure beyond STM journals and the fragmentation and lack of interoperability of systems and processes.
Open impacts	Openness scores should be developed, as well as utilization and economic impact measures. Ideas are proposed for what would be included in the baselines of each such evaluation. More research is needed and proposed, perhaps as standing (ongoing) OSI efforts.
Participation	1. Cultural change 2. Consistent messaging 3. More and better open publications 4. Institutional commitments to scholcomm efforts (including adjusting incentive and reward systems) 5. Support more research into solutions and sticking points

OSI2016 WORKGROUP	KEY RECOMMENDATIONS
Overload & underload	1. Increase information literacy efforts toward understanding the behavior of information systems and economies, which can in turn prepare students and scholars to make both more understandable to others. 2. Expand information literacy to include knowledge about the nature of computation and its control over what is accessible from and delivered to our devices. 3. To address the overabundance of information that causes overload, filtering systems are needed to identify, sort, select, and summarize relevant information. 4. To address the problem of underdelivery of or lack of access to information, known as information underload, remove widespread sociopolitical, technological, educational, geographic, and financial barriers. 5. Apply more open metadata, social media, digital tools and networked expertise to advance discovery. Better exposure and discovery options for scholarly products are still needed, as well as the means to understand and apply them. 6. Convert more content into a machine-shareable form and continue promoting openness through responsible curating, archiving and discovery of raw data. 7. Advocate for mandatory copyright exception for text mining and encourage publishers and vendors to remove obstructions to mining content.
Repositories & preservation	1. Clarify opportunities for UNESCO and WSIS to engage in this effort 2. Coordinate action among meta-organizations (e.g., COAR, CLIR/ DLF) 3. Raise funds for improved sustainability and stewardship through investments and endowments in repositories 4. Support aggregation driven by preservation concerns, such as: a. Electronic legal deposit (UK) b. Portico, Chronopolis, APTrust, and DuraSpace c. DPN, MetaArchive Cooperative, CLOCKSS 5. Build workflows and an ecosystem in order to ensure long-term access and preservation.
Peer review	1. Pre-publication peer review: ● We encourage the use of preprint servers ● We also encourage the facilitation of a flexible, nonlinear process of peer review outside of and supplementing journal-based peer review 2. Traditional peer review: ● We recommend that all disciplines work toward a culture of openness in peer review. ● We encourage the exploration and addressing of the problems, real and perceived, with transparency in peer review. 3. Post-publication peer review: ● We recommend the facilitation of post-publication review of traditionally reviewed publications. ● We recommend experiments with crowd systems that incentivize broad, representative participation—for example, with a currency, rating, or credit system. ● Any credits or ratings should be acknowledged by employers or funders of those doing the reviews as valid metrics in career progression. 4. Overall, more study, pilots and standards are recommended, as detailed in the report.
Embargoes	A project is proposed to study and reform the current embargo system. The stages of this project are as follows: 1. funder identification (already begun) and brief (drafted) 2. literature review (already begun) 3. case studies analysis 4. employing researcher(s) and surveying stakeholders 5. analysis of survey data and presentation at OSI 2017 (by the OSI 2016 Embargo Workgroup). The OSI Embargo Workgroup has prepared a set of draft survey questions and will analyze the survey data and present it to OSI 2017
Impact factors	1. DORA recommendations should be implemented. Future OSI workgroups should assess the initial response of research funders, especially in the biomedical field, to this proposed action and amend the following actions accordingly. 2. Create templates for universities / disciplines, to facilitate the development of appropriate tenure and promotion frameworks to implement DORA 3. Create an international metrics lab, learning from prior attempts to do this, and staffed with a coalition of groups already in this space (as identified in the report). 4. Share information about the JIF, metrics, their use and misuse, via a resource page on the OSI website and partnerships with institutions as identified in the report 5. Improve the validity of the JIF as one indicator of journal quality (OSI workgroups focused on indicators or impact factors should draft a list of improvements required to the JIF)
At-large	1. Promotion and tenure was discussed at some point in most, if not all, workgroups. Notably, there was no team expressly designated to tackling the question of promotion and tenure. There is recognition that while promotion and tenure is a key component of the publishing ecosystem, there is perhaps little that publishers themselves can do to influence the process. In this sense, OSI could conceivably work with other stakeholders throughout the academic system to express perspectives and positions on this evolution. 2. More focus on impact is another idea. The at-large committee's observations lend credence to the idea that a "spectrum of impact" measure might be developed by OSI to parallel the spectrum of open proposal. Specifically, a theme running as an undercurrent in many workgroup discussions was a greater need to focus on assessment of the value of research and scholarship. Notably, nearly all participants in the OSI2016 conference, and most stakeholders in the entire scholarly publishing ecosystem, have an interest and need to measure the impact of research and scholarship. 3. Improve composition and representation for OSI2017, begin focusing on action instead of ideas

OSI2017 OUTCOMES

The workgroup topics tackled at OSI2017—12 in all—grew out of workgroup recommendations from OSI2016. Some topics represented common threads from the OSI2016 meeting (such as the culture of communication topic), some were follow-up of particularly thorny topics (such as impact factors and peer review) and some were new topics added by popular demand (such as the issue of rogue solutions). The charge of these groups was to try to develop solutions to these issues. OSI2017 workgroup topics were:

- **IMPACT FACTORS.** Following up on recommendations from OSI2016, this team will dig deeper into the question of developing and recommending new tools to repair or replace the journal impact factor (and/or how it is used), and propose actions the OSI community can take between now and the next meeting. What's needed? What change is realistic and how will we get there from here?

- **GLOBAL FLIP & OTHER STUDIES.** Following up on the research ideas proposed by OSI2016 delegates, this workgroup will create broad action plans for a variety of studies, beginning with the global flip, moving next to embargoes, and also including publisher services disaggregation and an assessment of open impacts if possible—how fast, how even, systemic pressures and so on (referencing the OSI2016 workgroup papers on these various topics). Detailed study protocols aren't expected, but rather an outline of what to prioritize, and how to conduct this work without necessarily relying on large grants from neutral parties. With regard to the global flip, this research is needed to help answer the question of whether a flip using APCs is the right model to pursue (given concerns, for instance, about how this might affect access in the global south).

- **STANDARDS, NORMS & BEST PRACTICES.** What standards, norms, best practices, exit strategies, and incentive systems does the world of scholarly communications need? What is the future ideal? What will it take (including studies or pilots) to develop a better understanding of how the scholarly communication system works now? This workgroup will also necessarily touch on norms and definitions, so will include discussions as warranted about open and impact spectrums as covered in OSI2016.

- **FUNDING MODELS.** Following up on a proposal from OSI2016, this workgroup will identify and/or design new funding models for open, such as a venture fund that can allow more support for joint efforts, or propose ways to improve existing funding by improving the flexibility of library budgets (e.g., by examining the efficiency of "big deals").

- **INSTITUTIONAL REPOSITORIES.** Building on the findings of OSI2016's preservation, repositories and mandates workgroup, this workgroup will propose a way forward for repository and infrastructure solutions—detailing what's needed before action can be taken, what this action should look like, what actors should be involved, and so on.

- **PEER REVIEW.** Building on the peer review workgroup's proposals from OSI2016, this workgroup will develop a broader and clearer description of peer review that takes into account the different needs for different stages of review, as well as discuss possibly emerging issues such as the need to promote uniform interpretation and enforcement of peer review definitions, and will develop proposals for moving forward.

- **CULTURE OF COMMUNICATION.** Following a common thread from throughout OSI2016, this workgroup will develop partnership proposals for this community to work together to improve the culture of communication inside academia, particularly inside research. As part of this effort, it may be important to clarify messaging with regard to the benefits and impacts of open—and/

or determine what resources and information are needed before this messaging work can be done effectively (including proving the benefits of open to a skeptical research community, addressing the many concerns involved, explaining the pros and cons, and making the case for why this is worth the trouble).

- **PROMOTION & TENURE REFORM.** Following a common thread that ran throughout OSI2016, this workgroup will discuss promotion and tenure reform, developing a widely-accepted and inclusive model (or a path to a model) that stakeholder partners can use to help reduce the influence of journal publishing on promotion and tenure decisions and help make these decisions broader, more transparent, and less reliant on publishing and impact factor measures. Note that this group is not trying to remove publishing from tenure decisions—just break the feedback loop that is fueling undesirable outcomes in scholarly publishing, academia, and grant funding.

- **UNDERSERVED POPULATIONS & INFORMATION UNDERLOAD.** A new issue for OSI2017, this workgroup will focus on the unique challenges faced by the global south, the global diversity of scholarly communication, and the different issues, challenges and opportunities in both underserved regions of the world and underserved segments (like small colleges and small research firms). This group will also follow up on the information underload issue explored in OSI2016 (specific to research).

- **PATENT LITERATURE.** As a new issue for OSI2017, this workgroup will look at patent literature, research reports, databases and other published information. OSI by design has a university-centric and journal-centric bias to the perspectives being considered. Patent literature, research reports, and databases are also important sources of research information—more so than journals in some disciplines (although these still reference journal articles). As with journal articles, this information isn't always free or easy to find and is suffering from some of the same usability issues as journal articles.

- **HSS SCHOLARS & SCIENTISTS.** What are the unique needs and concerns of HSS scholars in this conversation? What are the unique needs and concerns of scientists (particularly in health/medicine)? This workgroup will recommend approaches and solutions to scholarly communications reform that work for both groups—a challenging assignment but important since common-ground conversations are what the research community is missing.

- **ROGUE SOLUTIONS & NEW OPEN RESOURCES.** What are the impacts of Sci-Hub and other rogue solutions on open access and what is the future of this approach, which may be gaining new mainstream support (noting for instance Wellcome's recent funding of ResearchGate)? What new resources should the scholarly community develop (and how) that would be useful and legal additions to our progress toward open (a new blacklist for instance, or new repositories)? This group will also integrate (to the extent possible) ideas raised by the information overload workgroup from OSI2016.

The following common themes emerged from this meeting:

1. **Open isn't free**. The focus of open cannot be about cost-savings. Open is going to cost money—the jury is still out on exactly how much. So if we all agree that more open is important, it is this importance that needs to drive our efforts going forward and not the promise of spending less. This said, cost is a critical issue. Developing ways to make access less expensive is essential. The extent to which open will do this, however, is unknown and needs more study.

2. **Open isn't easy**. Aside from the cost involved there is mixed messaging in this space (both in terms of what's being communicated at universities and from whom) and a lack of incentives for several key audiences, namely researchers. More trust and understanding between global scholarly communication stakeholders and stakeholder groups is needed (as discussed below). More balance is also important such as solutions that involve local input and incentives (local as in geographic, but also institution and discipline-specific), and approaches to open that are more inclusive (wherein we can all agree on the idea of open and then identify multiple paths to get there).

3. **Publishing is critical.** Vint Cerf mentioned this in his brilliant opening address and it was echoed by Keith Yamamoto in his equally brilliant closing. For Cerf, increasing the reproducibility of published research was paramount, and this requires increasing access, and this in turn requires a much more serious focus on digital preservation—from hardware and operating systems to software and formats. Without preservation and access, there is no modern scientific record. For Keith, the focus was on the act of publishing. "If you don't publish your experiment, it is exactly like not doing it." But the current system of publishing is too expensive for universities (barring any major restructuring of how much money is allocated to libraries, or how much money comes directly from the government to support publishing and sharing of data), so our focus needs to be on what now—figuring out who pays, figuring out what we publish and where, understanding how to measure the global impact of research and of our attempts to improve the flow of research information, making sure we're resolving researcher concerns, and more.

4. **OSI can help.** Several concrete ideas were proposed regarding where OSI can help push the ball forward on open. These included creating new resources for the open community, designing new open outreach materials tailored to specific audiences (instead of one-size-fits-all materials), funding studies to look at issues like how much libraries are spending on open, developing a more globally comprehensive understanding of researcher needs and incentives, convening conversations between funders, helping to identify best practices, promoting the DART framework for open (discovery, accessibility, reproducibility and transparency), and getting behind efforts like OA2020 and DORA. Please see the summary of recommendations table as well as individual workgroup and stakeholder reports for more details.

5. **We're on the right track.** OSI isn't going to be able to tackle this issue by itself—we all acknowledge that this effort's current lack of significant funding makes it an unlikely candidate to manage a global revolution in scholarly communications, but most participants seem to agree (based on a survey following OSI2016, plus informal impressions and feedback since then) that OSI has potential. Whether this means serving as a forum for discussion, a proponent of inclusive ideas, a convener of parties, or even a developer or funder of new products

Reknowned scientist Vint Cerf, whose full list of awards and accomplishments is beyond the scope of this paper but is best known as the Vice President of Google and co-inventor of the Internet (along with Bob Kahn), gave the opening address at OSI2017. Cerf's main theme was the need to align incentives—that open research would only succeed in the long term and to its fullest extent if researchers practiced openness because doing so was in their own best interests. The challenge for OSI and policy makers, recommends Cerf, is to figure out what kind of open efforts and structures will lend themselves to this alignment.

and projects, the big tent approach is better understood this year than last (although as a group we're still not settled yet on exactly how this group should be managed, if at all). Keith Yamamoto noted one specific way in which OSI might be on target: Helping identify a set of common principles that define what we want at the endpoint. If we can identify these principles as a group we can then make a broad model that can be adapted or adopted.

The focus of open cannot be about cost-savings. Open is going to cost money—the jury is still out on exactly how much.

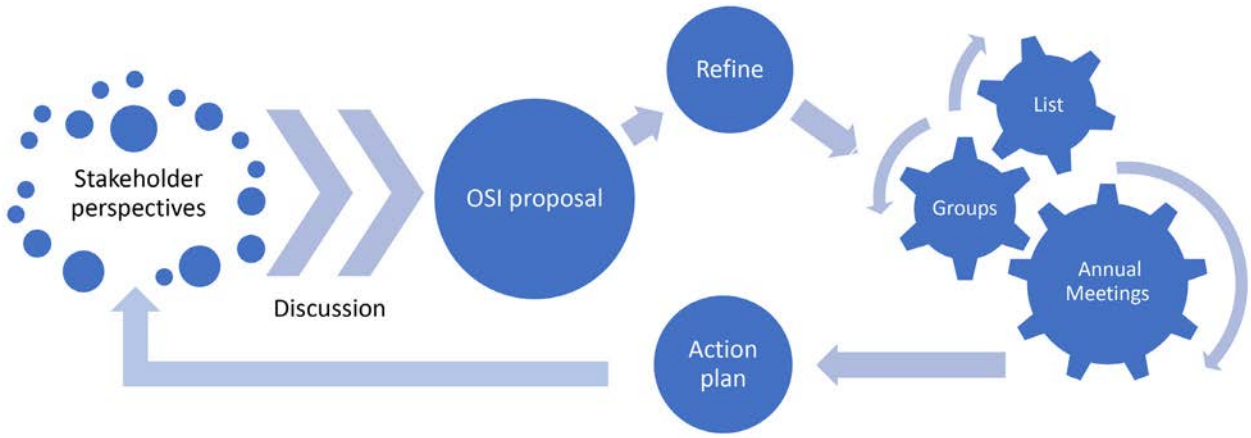
6. **We're more alike than unalike.** Several stakeholder groups (in their reports) pushed back against the idea of having distinct groups represented in OSI. We have differences of opinion in this community but there is often as much diversity of opinion within a single stakeholder group as there is between groups. Everyone agreed that we need more involvement from the global community, and also from researchers themselves.

7. **Convergent needs are everywhere.** The OSI2017 HSS & Scientists workgroup in particular identified a raft of areas where these often disparate communities can find common ground—for instance, on the need for visibility, public engagement, preservation, and interdisciplinarity. Convening action on this common ground is the next step. Some stakeholder groups (namely scholarly societies) felt they were already cohesive enough and well-positioned enough that they could advance agendas and promote culture change—that these convergent needs were (or could become) clear and as actionable. Similarly, several scholarly infrastructure groups are ready to work together and with OSI to help promote and secure open.

8. **Accountability & recognition.** We need to get institutions invested in this effort (not necessarily financially). We all have a stake in the outcome. What this means in practice is to be determined. As far as recognition is concerned, several groups expressed an interest in developing a way to recognize good work in open—a type of Nobel Prize for open.

9. **Trust**. This conversation needs trust to move forward. There is a lot of mistrust in the system—generally not inside OSI, which is seen by many participants as something of a unique refuge and a valuable opportunity to speak across the aisle—but in the larger scholarly communication system which has been so polarized for so long (indeed, there are people and groups in the schol-comm system who are actively opposed to OSI because it includes commercial publishers, and this is seen as a waste of time and/or potentially harmful to the cause of open). Still, even within OSI we haven't started the process yet of negotiating solutions to issues based on the recommendations of OSI2016 and OSI2017 participants, so our fault lines may just be buried for now. How and where to have these conversations is to be determined—maybe not in full-group annual meetings but we will continue to make progress in this regard over the next several years (most immediately through more online engagement and more regional meetings).

In addition to identifying these common themes, OSI2017 participants began identifying the general contours of the possible solution space ahead. A clear consensus started to emerge by 2017 on the specific ways this group should begin moving down this road together toward workable solutions. This consensus was prodded along by OSI's unique deliberative process, As designed (although we didn't always hit this mark with every topic) the group raised a wide range of perspectives on the listserv, then explored these concerns in detail in meetings, subgroups, and through additional research, and fed conclusions back to the listserv. Over time, this triangulation and iteration process led to a reasonably clear idea of the group's concerns.



The top concerns identified at OSI2017 are as follows:

1. **Culture of communication in academia**: We need to clarify messages about open and break down barriers and simplify pathways to more open adoption. We also need to engage universities and scholarly societies in a conversation to encourage new advancement pathways that include more use of open, and that can help untangle publish or perish attitudes and metrics like the impact factor from promotion and tenure considerations.

2. **Funding**: There is no single model of open that works for all stakeholders and institutions everywhere. As a community, we need to stop aligning our funding primarily behind one-size-fits-all solutions, and instead fund a wider variety of approaches for a variety of actors and audiences.

3. **Studies**: There are many gaps in our understanding of scholarly communication, from predatory publishing to the global flip to embargoes, citation advantages, the economic benefits of open, and more. We should work as a community to fund and conduct studies to fill in these information gaps.

4. **HSS & Science**: The fact there are no one-size-fits-all solutions is nowhere more apparent than comparing the different needs of HSS disciplines (like history) with disciplines in the natural sciences. This said, while we can develop better tailored solutions (or disciplines can develop their own), we should also continue to promote areas of mutual interest and benefit.

5. **Impact factors**: Impact factors are loved by some stakeholders, despised by others. They are a net positive for some, and a terrible scourge for others. We need to reform the use of impact factors—this much is clear. Exactly how is another matter.

6. **Open IP**: The global community should work with WIPO, NISO, and other relevant organizations to establish new global standards for open IP and create IP literacy materials for the research community.

7. **Peer review**: We need to work as a community to develop new global standards for journals. We also need to study the effectiveness of different models and support the community as it experiments.

8. **Institutional repositories**: Repositories are a crucial tool in the custody chain of research preservation. We need to better understand the challenges ahead and ensure we're asking the right questions and pursuing the best solutions.

9. **Rogue solutions**: Our community must take a stand against Sci-Hub types of solutions that violate copyright laws and are off the open spectrum, while also supporting new and entrepreneurial approaches to open.

10. **Standards**: There are many issues in this space that would benefit from a standards-based approach—from what we consider to be "open" (here again, many in OSI encourage recognition of the entire open spectrum) to what publishers should do, what best practices researchers should follow (beyond DORA), and much more.

11. **Underserved**: There is much work we can do as a community to encourage more openness in universities and public sector institutions, better address the wide variety of research-related needs and concerns that emanate from the vast diversity and asymmetries of the scholarly communication environment (such as indexing, standards, and promotion and tenure practices), and narrowing the affordability gap.

The table below summarizes the specific recommendations put forward by OSI2017 workgroup participants. Here again, bear in mind that each of these groups was comprised of top leaders representing several different stakeholder groups. These recommendations are not unilateral or unrealistic, but represent a common ground understanding of the challenges of open science and how to address them:

OSI2017 WORKGROUP	GOAL	KEY RECOMMENDATIONS	TOOLS	TAKEAWAY
Culture of communication	Improve the culture of communication around open access inside academia, particularly inside research	1. Clarify the message about OA. Identify what OA is, and what it is not 2. Create and communicate messages for particular communities regarding the benefits and impacts of Open 3. Determine what resources and information are needed before this messaging can be effective (1)	Website, plus partnerships, awards, workshops, stories, social marketing, communication mapping (for each institution), OSI as fulcrum or catalyst	Better communication needed to advance open
Funding	Identify and/or design new funding models for open, or propose ways to improve existing funding by improving the flexibility of library budgets	1. One model of open will not work for all communities. Stop pursuing one-size fits all. 2. Share lessons from different communities (blogs, case studies, etc.) and set and track goals to increase OA 3. More research: Find more info on APC costs and spending, identify income-generating possibilities in scholarly publishing, identify economies of scale to reduce access costs	Website	Need better OA tech, coordination, communication, incentives, rewards, and more. Address these issues first and more money for OA will follow.
Global flip and other studies	Create a broad action plan for the global flip. Other studies were acknowledged but not addressed (embargoes, publisher services disaggregation and an assessment of open impacts)	1. Support development and dissemination of tools to increase understanding of the potential impact of a Global Flip on library budgets. 2. Commission a third-party study to analyze the financial and scholarly implications of the flip on both publishers and the academic community, 3. Identify, support, and share information about cooperative models that align with the Global Flip strategy to increase trust and transparency among stakeholders	Website (gathering more understanding about concerns, impacts, and showcasing global flip as a path and not a destination)	More understanding needed, followed by broad sharing of best practices

OSI2017 WORKGROUP	GOAL	KEY RECOMMENDATIONS	TOOLS	TAKEAWAY
HSS & Science	What are the universal solutions for both HSS & STEM with regard to open? HSS and STEM have different challenges and much more focus and funding) is available for STEM than HSS.	1. Disciplines need to find their own solutions from within. Pilot an OA program in HSS or social science. 2. Promote areas of interest/benefit convergence between HSS & science: a. Visibility b. Public engagement c. Preservation d. Text and data mining e. Interdisciplinarity	Website, more funding for HSS (legislation), common solutions	OA models are not strong in HSS. More communication is needed about the different needs of HSS & STEM
		1. Interview journal editors to find out what's working, what's not, and what's missing 2. Get behind effort to share information on metrics best practices and drive innovation across disciplines and outputs 3. Encourage disciplines to own their own assessments (work with societies to get this effort stated)		
Open IP	Develop recommendations relevant to improving the discovery, access and use of patent data and closely-related IP	1. Promote guiding principles for Open IP as detailed in workgroup report and explain how this ties in to the open spectrum 2. Work with WIPO to help establish international standards for open IP 3. Create IP literacy materials for the research community	Partner with WIPO	Open IP is an emerging issue with many needs and challenges. OSI can help coordinate these needs and challenges with respect to scholarly communications.
	Develop a broader and clearer description of peer review that takes into account the different needs for different stages of review, as well as discuss possibly emerging issues such as the need to promote uniform interpretation and enforcement of peer review definitions, and develop proposals for moving forward.	1. Work as a community (coordinating with partners like COPE) to define more clearly what is and isn't peer review, in order to impose an accepted standard that all journals will need to follow. 2. Support or conduct studies that investigate the effectiveness of different modalities of peer review (open vs. closed, two-person vs. many, etc.) to help provide support and direction to the scholarly communication community as it experiments with different peer review systems 3. Investigate the feasibility of publisher services disaggregation, whereby peer review (and other services such as editing) can be offered as discrete services		The best course of action for this community will be to support continued investigation and experimentation with new methods and weigh the pros and cons of each
Institutional repositories	Propose a way forward for repository and infrastructure solutions, detailing what's needed before action to be taken, what this action should look like and what actors should be involved	1. Step 1: Study and map the current IR network. Identify the nodes, as the potential networks and sub-networks. 2. Step 2: Convene a conversation with major and globally diverse IR stakeholders under the auspices of UNESCO to ask what problems we're trying to solve, etc. (2)	UNESCO-led global meeting	Institutional repositories mean different things to different people. Finding common ground on the future of IRs is important—aligning incentives that will result in more interoperability and sustainability.
	What are the impacts of Sci-Hub and other rogue solutions on open access and what is the future of this approach?	1. Sci-Hub and any other service that acts in blatant violation of copyright laws, does not fall within the definition of open access and is not a solution to be considered by the workgroup 2. To get away from the solely negative connotations of "rogue," we decided to coin a more expansive term and asked, what can we learn about scholarly communication from the rise of New and Entrepreneurial Approaches to Open or...NEATOs		NEATOs highlight pain points in the current scholcomm system. They are less effective at addressing the large-scale problems in scholcomm or advancing the cause of open.

OSI2017 WORKGROUP	GOAL	KEY RECOMMENDATIONS	TOOLS	TAKEAWAY
Standards	Identify existing relevant standards, evaluate areas of overlap or perhaps conflict, which can be used to foster increased collaboration, and areas where relevant standards do not yet exist, which can be used to focus future effort	1. Modify DART spectrum from OSI2016 to become the DARTS spectrum (adding "sustainability") and officially endorse this as a group (3). Connect DARTS to the Open Science Framework and also a new Open Standards Matrix (as described in the report) 2. Work toward standardization across many other issues and questions in scholcomm, from peer review to data deposits by coordinating with other actors in this space and connecting related efforts 3. Advocate for tools that make every part of the research workflow more connected, efficient, and preserved, such as the Open Science Framework.	Promote DART, collaborate with many partners, marketing/outreach (website)	Creating a more transparent scholarly ecosystem requires rethinking how each individual and institution is rewarded and recognized for their roles in knowledge creation and dissemination, so that transparency becomes a key metric of success and accountability. Furthermore, it requires careful attention in order to design a system that is sustainable, just, and responsive to new evidence.
Promotion & tenure reform	How can professional advancement practices—including and beyond promotion and tenure review standards—be realigned to encourage researchers' adoption of open access, open research, and open educational practices?	1. Research the existing landscape to better understand open research recommendations and requirements in professional advancement materials (P&T guidelines, job advertisements, university contracts, annual appraisal guidelines, etc.) at leading universities worldwide. 2. Engage scholarly societies and high-level university research administrators and provosts to learn more about the challenges of promoting openness in promotion and tenure from their perspective. 3. Most debate around open research practices and professional advancement only address STEM use cases. OSI delegates should conduct a thorough literature review and interview and survey faculty from across all disciplines, career levels, and institution types to find answers to key questions (4)	Research, partnerships (to aid in both research and outreach/promotion), and then carry out a plan to present recommendations, gather feedback, and promote piloting and adoption of new p&t guidelines	Academia needs: A closer reading of research by committees charged with evaluation, rather than relying on the surrogates of publication venue and impact factor; a broader view of the types of scholarly outputs that committees should consider as evidence of productivity and impact; an explicit acknowledgment of the benefits of publishing in open access venues; and incentives that encourage openness.
Underserved	What are the unique challenges in scholcomm faced by the global south?	1. Build an APC-finder tool 2. Policy shifts needed: Encourage more public sector shifts toward openness, more incentives for universities to publish in in-country journals, strengthen regional OA publishing systems, linking of OA with science policy agendas, expansion of LMIC aggregator platforms, more south-south networking and collaboration 3. Development of visible displays of verified, appropriate, and objective standards is needed to showcase excellent journals from developing countries and mentor young emerging ones, dispelling stereotypes and excluding fake journals.	Partnerships, broad policy development and implementation, standards and best practices initiatives	There is much bias in the current global system of scholarly publishing. Unless corrected, this bias will continue to widen the gap between the global north and global south with regard to scholarly publishing opportunities and outputs.

Notes:

(1) including showing the benefits of Open to a skeptical research community; addressing the many concerns of stakeholders; clearly explaining the pros and cons; and demonstrating the case for why the transition to Open is worth the trouble

(2) These questions include: What problems are repositories trying to solve? What repository behavior would we like to see and why? How can we work together to incentivize it? How can we attend to different scholcomm needs across different fields? How can we make everyone accountable: publishers, libraries, funders, researchers? How can we achieve a sustainable, decentralized, networked system while gaining efficiency through higher levels of aggregation? How do we minimize waste and maximize value in the repository ecosystem?

(3) Proposed: The Opens Scholarship Initiative envisions a scholarly community where all parts of the research lifecycle are openly available. In order to achieve this vision, OSI adopts the following principles in order to evaluate policy proposals and actions: research products must be made more Discoverable, Accessible, Reusable, Transparent, and Sustainably supported. Policies that increase openness among one or more of these dimensions, while having no net decrease on any other, are aligned with the mission and purpose of OSI delegates and member institutions.

(4) These questions include: Where are the pain points for researchers with respect to Open Access and open research practices? How many researchers worldwide have funding requiring open publishing and open research mandates? What are the pain points for those researchers? How do institutional OA policies impact tenure-track faculty that are also required to follow promotion and tenure requirements that disincentivize open research practices? Do funder requirements for Open Access positively affect open research practices in the tenure and promotion process, where such P&T requirements weigh research funding into P&T cases? What can we learn about researcher evaluation from research institutes or academic libraries that don't have tenure (e.g. Scripps or HHMI)? What are the best parts of research evaluation practices worldwide, which we can borrow from to promote openness? What are the worst evaluation practices that should be avoided?

In addition to workgroup meetings, stakeholders were also asked to meet. It quickly became apparent that some stakeholder groups were too heterogeneous to really be called "groups" at all, so this realization may force some reconsideration of the focus on stakeholder groups at future meetings. This said, the stakeholder meetings served an important purpose insofar as refocusing OSI's attention on what it can do together to advance the cause of open. While workgroup conversations focused on issues, stakeholder groups focused on relationships, and it's these relationships that will be at the center of OSI's reform efforts going forward.

The stakeholder groups that convened at OSI2017 and the recommendations they issued are as follows:

OSI2017 STAKEHOLDER GROUP	GOAL	KEY RECOMMENDATIONS	TOOLS	TAKEAWAY
	More collaboration and cooperation amongst infrastructure groups is needed to advance open. Given that research transcends disciplines, geography, institutions and stakeholders, the infrastructure that supports it needs to do the same.	1. Scan the current bits and pieces of infrastructure and evaluate their adoption on a global scale 2. Engage with the "owners" of the infrastructures to push for measures that can secure global implementation/adoption		Infrastructure is critical to open but these structures originated and are oriented toward the North/West, and most developed without sufficient consultation with the global community
Journal editors	What are the common issues across all journals in all regions that can be improved, particularly with regard to journals in the global south?	1. Pursue systemic changes regarding standards, indexing and language access (1) 2. Educate the academic community about the importance of journals to research culture and open publishing (including editors, peer reviewers, editorial boards); the role of impact factors in P&T in undermining smaller, more specialized journals and those in the global south; the importance of mentorship; learning from global south journals, many of which are already OA and publishing at low cost; and addressing academic culture change to improve research standards (2).	International collaboration and agreement across disciplines on new standards and approaches	Journals in the global south face unique challenges. These are partly the result of having to try to fit into an expensive and rigid "northern" system, and partly because of lack of funding and training and a less developed research and academic infrastructure.
	What are the common interests and perspectives of libraries and how can they work together to help advance open?	1. Support, engage and/or collaborate on actions that continue to build out the framework for more open (3) 2. Support, engage and/or collaborate on actions that continue connecting resources and efforts to make more open possible (3) 3. Support, engage and/or collaborate on actions that continue to improve the capacity of existing open resources and efforts (3)		Despite wide differences in resources, definitions and more, there is broad support amongst libraries everywhere for open—to provide stewardship in discovery, preserve and disseminate the scholarly record, ensure the efficient and effective use of budgets, and to advocate for equitable access.

OS12017 STAKEHOLDER GROUP	GOAL	KEY RECOMMENDATIONS	TOOLS	TAKEAWAY
Open knowledge groups	What are the common interests and perspectives of open knowledge groups?	1. Address question 1: OA jargon is a barrier to understanding amongst stakeholders. What can we do to reduce the jargon? 2. Address question 2: We need to deliver more content to the communities who need it. How do we do this? 3. Address question 3: How do we establish financial sustainability for a free-free environment (free to publish, free to consume)?	Communication, clarity, standards, agreements, outreach	There's a lot of diversity in the open knowledge stakeholder group. This is an exciting time to innovate, and there are lots of good solutions emerging.
Commercial publishers	What are the common interests and perspectives of publishers with regard to open?	1. Address question 1: There is little engagement from funders at the OSI meetings and there is virtually no attendance from the Global South. Will we fix this? 2. Address question 2: It is unclear what the exact impact of the initiative can be, particularly as it will be very difficult to unite all stakeholders in recommendations or even opinion statements. How will this work with regard to commercial publishers? 3. Address question 3: Publishers are concerned about the vulnerability of the organization, as it is basically a one-man-show in its current form. Will this be fixed?	More funding, more discussion. Also more joint ventures in the development of common frameworks for storage, common definitions for open, etc.?	Open access is important for all publishers. Publishers are also important drivers of innovation in scholarly communication, and are committed to serving their clients and customers. However, there are a wide variety of publishers with a wide variety of business models, opinions, policies and strategies. Also, because many of them compete with each other, it is in many cases forbidden by law and/or unwanted (for competitive reasons) to share opinions, policies and strategies.
Research universities	What are the common interests of research universities in advancing open?	1. Thought exercise: If we reinvented the modern research university library from scratch, what would it look like? 2. Thought exercise: Think critically and creatively about the development of programs and platforms that explore open in ways that meet the needs of our scholars. Can we imagine and realize, for example, university-supported platforms for open data sharing that invite peers in as collaborators rather than competitors? Can we incorporate commercialization into our vision of open scholarship as one of a number of modes of dissemination? 3. Real advancement requires support for the innovation and experimentation of our scholars, structures tolerant of failure and admitting of a new range of techniques and approaches. Solutions will come from the many, many stakeholders that comprise our institutions.	Dialogue (plus a convening party) to expand into creative solutions at local and consortia levels, and openness to a variety of solutions and approaches	Research universities are committed to exploring ways to advance open research, but also sensitive to the reality that one-size-fits-all approaches do not reflect the needs and concerns of all scholars (without whom there would be very little intellectual product to debate).
Scholarly communication experts	What are the common interests that scholcomm experts have with regard to open?	1. Internal to OSI: Get more input and involvement from authors, researchers, research offices and administrative leaders. 2. Between OSI and the broader scholcomm community: Create/facilitate an OSI fellows program that helps share insight between scholcomm silos by seconding staff from libraries to publishers, research admin offices to scholcomm offices and so on. Also, ask OSI participants to serve as ambassadors to their respective communities to facilitate the broader exchange of ideas and perspectives. 3. In the scholcomm community: Establish open norms and standards to make it easier for everyone to participate in the open ecosystem. Also, support more author choice in this ecosystem	More dialogue, engagement, involvement, bridge-building, participation, flexibility—more of everything	This stakeholder group shares a perspective of OA that reflects both the need for clarity in communicating about what open scholarship means, and a richer underlying landscape enabling a spectrum of openness for different scholarly objects. This group also shares an interest in more clearly fostering and articulating the incentives for OA publishing to effectuate behavioral changes.

OS12017 STAKEHOLDER GROUP	GOAL	KEY RECOMMENDATIONS	TOOLS	TAKEAWAY
Scholarly societies	What are the common interests of scholarly societies and how can they work together to advance open?	1. Socialize concepts of open more within communities, including by educating constituencies on the benefits and requirements of open. Additionally, offer platforms and recognition for those making the shift by managing member metadata, connecting, tracking, and rewarding contributions to open, offering discipline-specific awards for open, building scholarly communication networks, and offering micro-credentialing in open. 2. Bring together independent society publishers to determine if collaborations can be made. Determine how to increase efficiencies across the ecosystem. 3. Determine how the funds in the system can be redistributed (institutionally, nationally, internationally) to provide a more transparent economic relationship among producers, consumers, and publishers of information.	Conversation, collaboration, pilot programs	Societies are in a unique position to influence the move toward open because they represent large groups of professional constituencies. This said, society publications are self-sustaining and fund other society programs and services, and traditional society publishing take care to steward and advance research, so there's a disincentive to change models.
Summit group	What are the high-level takeaways from OSI2018?	1. OSI needs to put new communication tools and processes in place in order to continue to engage people productively, particularly across stakeholder groups, throughout the year.	Communication	Even more important than governance structure, OSI needs to put new communication tools and processes in place.

Notes:

1. Proposed systemic changes include:
    a. Standards:
        1. Establish (with global representation) clear, achievable, evidence-based journal standards focused on improving the quality, transparency, and reproducibility of research, rather than the appearance of the journal. Standards should have few out-of-pocket financial requirements and means for journals to pay for them should be addressed.
        2. Contact CrossRef and CLOCKSS regarding how to achieve (markedly) reduced costs for Global South and other small under-resourced journals
        3. Develop (with global representation) data policy standards regarding authors' retaining and sharing data
        4. Identify free or nearly free data repositories such as Figshare for author and editor reference
        5. Develop (with global representation) standards for data privacy for Global South authors, institutions, and editors to use
        6. Develop (with global representation) approaches for Global South institutions to develop institutional repositories – funding and best practices
        7. Study why some journals may cease to adhere to standards and determine ways to prevent declining standards
    b. Indexing:
        1. Catalog requirements of major indexes for editors to easily reference; synthesize requirements into standards to improve likelihood of indexing; identify issues with Global South journal practices that impede indexing, and causes and ways to alter their practices
        2. Identify liaisons at major indexing organizations to turn to when editors have questions
        3. [Until truly global indexing is available] Strengthen regional journal indexes that national research evaluation systems, institutions and researchers (including systematic reviewers) can use to ensure that they are capturing all relevant research
        4. Evaluate standards of "international" indexes to determine why Global South journals are preferentially not indexed
        5. Approach indexing organizations regarding requirements that may not be essential and inequality practices that may introduce bias against Global South journals
        6. Approach Google Scholar re: increasing the likelihood that Global South journals and articles will appear in search results
    c. Language Access:
        1. Identify (with global representation) ways to encourage journals to publish in the main language of the country (with English abstracts provided by the author if the journal cannot afford professional translation)
        2. Convey (with global representation) the importance of publishing in the country's language to academic institutions within the country
        3. Convey to Google (with global representation) the importance of improving automated translations of research (particularly medical research) to at least improve the first pass of research translation before professional translators or authors refine translations.
2. Proposed culture changes include:
    a. Importance of Journals to the Research Culture
        1. Convey to academic institutions and funders the importance of journal editors to the culture of academic scholarship
        2. Encourage institutions to recognize the services that peer reviewers and editorial boards provide as important academic achievements
    b. Impact Factor

1. Convey to Global South academic institutions and funding organizations the problems that use of impact factor and publication in Global North journals as criteria for research impact create for Global South journals and the fostering of academic culture in the Global South; explain the limitations of the impact factor and the alternative means of judging impact set out by DORA and implemented by some funding organizations such RCUK/MRC
2. Examine incentives for Global South researchers and how incentives might be changed to promote open publishing and publishing in Global South journals

c. Importance of Mentorship
   1. Examine with potential funders ways in which a Global South network might be developed, incorporating existing standards such as ORCID
   2. Contact scholarly societies to determine feasibility of new programs pairing specialty societies in the Global North and South

d. Learning from the "South"
   1. Create a clearinghouse for ways in which journals, publishers, and indexers in the Global South and North are improving quality, implementing standards, streamlining publishing, evaluating journals, or otherwise improving the publishing process. The clearinghouse should be available for researchers to evaluate the efficacy of particular approaches for different regions of the world.

e. "Open" questions
   1. Develop (with global representation) best practices for journals based on their funding model, including those funded by government, institutions, and other funders, to preserve editorial freedom and prevent conflicts of interest
   2. Involve stakeholders in various regions in discussions around how to change academic culture to value openness and to value publishing regionally in the research language
   3. Involve stakeholders to identify ways in which institutions and funders can incentivize ethical research and detect and prevent research misconduct.

3. Library-identified efforts for support, collaboration and/or engagement include:
   a. Shared training and teaching resources
   b. OERs as a means to promote more open practices on campus
   c. Optimization of open source repository platforms
   d. Improve discovery of what is already made available
   e. Engage with projects such as Initiative for Open Citations (I4OC)
   f. Identify opportunities for cross-institutional OA publishing
   g. Exploration and investment into the different models of Open Access from a library perspective that recognizes institutional diversity (i.e. Pay it Forward project)
   h. Journal Assessment (possibly addressing white/black lists of journals)
   i. Advocacy efforts that push a need for greater transparency in the pricing of OA journals
   j. OSI facilitation of more communication and information sharing across stakeholder groups (i.e. Tenure reform and Impact Factor groups)

OSI2017's global flip workgroup recommended that in order to improve our understanding of the global flip idea and its potential impact, we should (1) enable the further development and dissemination of tools such as UC's Pay-It-Forward calculation tool, (2) Commission a third-party study to analyze the financial and scholarly implications of the flip on publishers and the academic community, (3) Share results and best practices of key players already involved in the transitional offsetting agreements as part of the global flip strategy, and (4) Identify and support cooperative models that align with the global flip strategy to increase trust and transparency among stakeholders and serve as best practice guides. Pictured from left to right are Lorcan Dempsey, Vice President of Membership & Research and Chief Strategist, OCLC; Megan Wacha, Scholarly Communications Librarian, City University of New York; Colleen Campbell, Director, OA2020 Partner Development, Max Planck Digital Library; Ralf Schimmer, Head of Scientific Information Provision, Max Planck Digital Library; Kamran Naim, Lead Researcher, Open Access Cooperative Study, Stanford University; Eric Archambault (speaking), President and CEO, 1science; Caroline Sutton, Head of Open Scholarship Development, Taylor & Francis; and Roy Kaufman, Managing Director, New Ventures, CCC. Not pictured: Wim Van der Stelt, EVP Strategic Relations, SpringerNature.

The following workgroup reports were prepared by OSI2017 conference participants:

- OSI2017 Summary Report
- Report from the Culture of Communication in Academia Workgroup
- Report from the Funding Models Workgroup
- Report from the Global Flip Workgroup
- Report from the HSS & Scholars Workgroup
- Report from the Impact Factors Workgroup
- Report from the Institutional Repositories Workgroup
- Report from the P&T Reform Workgroup
- Report from the Patent Lit Workgroup
- Report from the Peer Review Workgroup
- Report from the Rogue Workgroup
- Report from the Standards Workgroup
- Report from the Underserved Workgroup

In addition, the following stakeholder reports were prepared:

- Report from the Commercial Publishers Stakeholder Group
- Report from the Infrastructure Stakeholder Group
- Report from the Journal Editors Stakeholder Group
- Report from the Open Knowledge Stakeholder Group
- Report from the Research Universities Stakeholder Group
- Report from the Scholarly Libraries Stakeholder Group
- Report from the Scholarly Societies Stakeholder Group
- Report from the Scholcomm Experts Stakeholder Group
- Report from the Summit Group

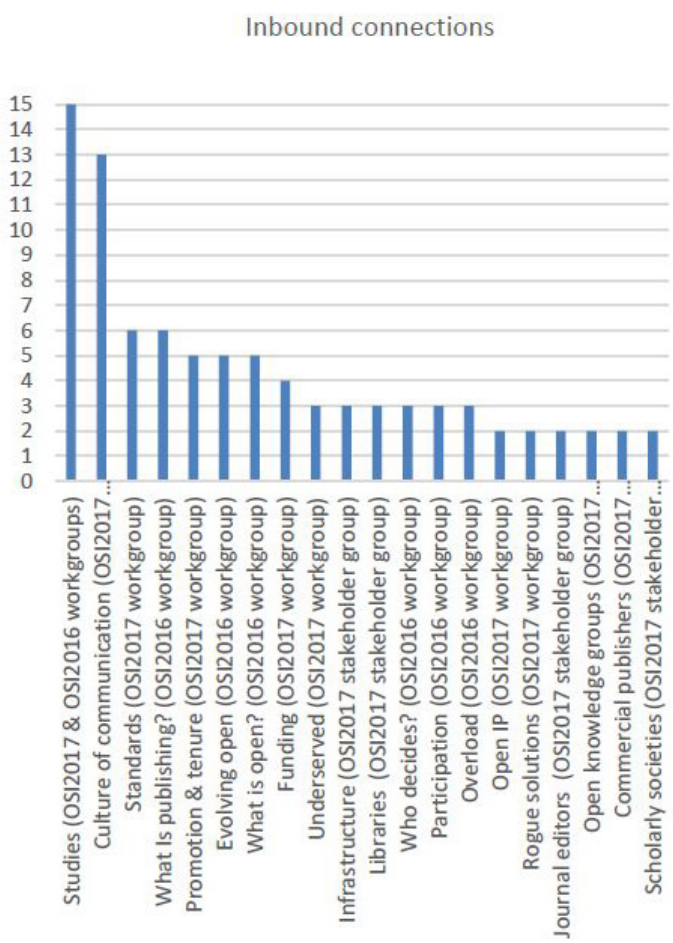
OSI2016–17 SYNTHESIS

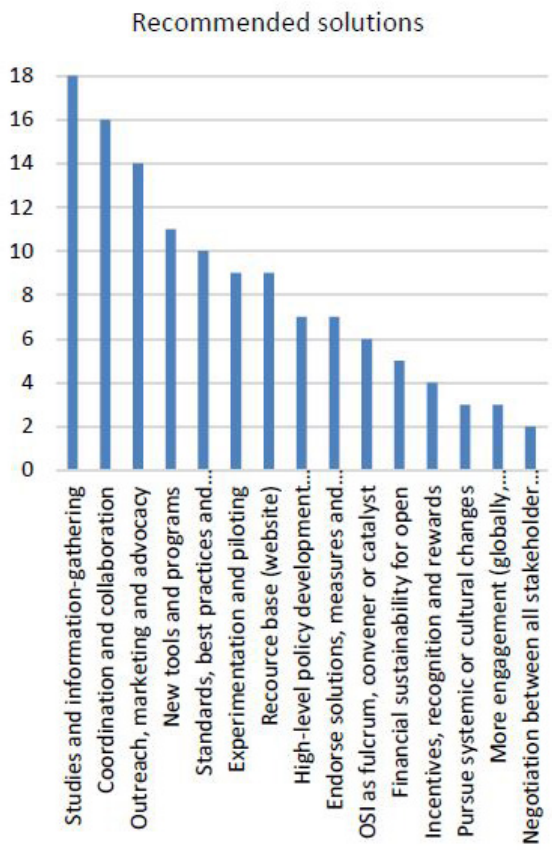
Before the next meeting occurred, it was important for OSI to first synthesize the recommendations of OSI2016 and OSI2017. There are several ways to do this, of course. The method we used was to calculate the "connectedness" of the reports produced at OSI2016 and OSI2017 in order to supplement the "gut feeling" takeaways from these meetings. Most reports had three to five "outbound" connections where the issues being addressed by other workgroups were noted as being key. At the same time, most reports had a smaller number (zero to three) of "inbound" connections, where other groups identified a particular workgroup's issue as being key.

This discrepancy between inbound and outbound connections in OSI2017 reports is mostly owing to the large number of inbound connections made to the studies workgroup and to the culture of communications workgroup. That is, a large number of workgroups in OSI2016 and OSI2017 felt that the two most important concerns with regard to reforming scholarly communications were the need for more studies and information, and the need to reform the culture of communication in academia. Issues such as standards and developing a clearer sense of what "open" means were also viewed by OSI participants as being key.

Another approach we used to synthesize the recommendations of meeting delegates was to examine the connectedness of specific tools and processes—more meetings, more collaboration, outreach efforts and so on. Here again, the key recommendation from OSI2016 and OSI2017 participants was that we need to gather more information. There are many gaps in our understanding, and more information is needed before we can move forward aggressively and assuredly in a number of areas. However, not every recommendation involved gathering more information. Almost as many recommendations called for more coordination and collaboration on common goals, more outreach programs geared toward clarifying the open landscape and sharing information with each other (key to reforming the culture of communication), and more focus on standards development and the deployment of tools and resources that can serve the scholarly communication stakeholder community.

These recommendations were forwarded to OSI's "summit" group, which began developing OSI's long-term action plan based on this input.





OSI2018 AND OSI2019 SUMMIT MEETINGS

Small groups of OSI participants met in person in 2018 and online in 2019 to further distill OSI's lessons of experience and recommendations and map out an "action plan" for the 2020-25 time period. The details of these groups' deliberations are archived in the annex section of OSI's Common Ground paper (Hampson 2020).

Over time, these deliberations led to the development of OSI's Plan A, which synthesizes all the most significant themes and recommendations that have emerged from OSI's work. Plan A plan recommends that the international scholarly communication community begin immediate and significant action to:

- **DISCOVER** critical missing pieces of the open scholarship puzzle so we can design open reforms more effectively;
- **DESIGN**, build and deploy an array of much need open infrastructure tools to help accelerate the spread and adoption of open scholarship practices;
- **WORK TOGETHER** on finding common ground solutions that address key issues and concerns (see OSI's Common Ground policy paper for more detail); and

- **REDOUBLE OUR COLLECTIVE EFFORTS** to educate and listen to the research community about open solutions, and, in doing so, design solutions that better meet the needs of research.

In pursuing these actions, our community should:

- Work and contribute together (all stakeholders, including publishers);
- Work on all pieces of the puzzle so we may forge a path for open to succeed;
- Discover missing pieces of information to ensure our efforts are evidence-based;
- Embrace diversity;
- Develop big picture agreement on the goals ahead and common ground approaches to meet these goals; and
- Help build UNESCO's global open roadmap.

Plan A recommends that the community's work in this space be:

- Common-goal oriented;
- Accountable;
- Equitable;
- Sustainable;
- Transparent;
- Understandable; and
- Responsive to the research community.

Plan A synthesizes the significant themes and recommendations that have emerged in OSI—namely, to discover missing information, and work together on open science goals, solutions and outreach.

It is vital to broader society to make research more open. It is also vital that our approaches be developed carefully and in close collaboration with each other. In doing so, we will ensure that scholarly research is protected during this transition, and that it is well-served by the outcomes of our efforts.

Much more detail about Plan A is available from the Plan A website at http://plan-a.world. Some of this detail will be listed in the policy recommendation section later in this report.

Our feeling in OSI is that this general emphasis on working together on big picture solutions, grounding our efforts on more facts and actions, and embracing the diversity of this space as well as our common interests and concerns, will create the kind of future we need for open science. Indeed, only this approach will create this future. Other approaches that fail to recognize our community's diversity or our common ground may result in further division in this space, or even a fracturing of the solution space into approaches that work for just the EU, or just the US, creating separate and distinctly unequal worlds of science. For this reason, we hope this common ground approach carefully developed by OSI's diverse and high-level group after extensive deliberations will be the approach that UNESCO chooses as well.


OSI2017
OPEN SCHOLARSHIP INITIATIVE
GEORGE WASHINGTON UNIVERSITY
OSI2018
OSI SUMMIT MEETING, WASHINGTON DC
GEORGE MASON UNIVERSITY
GE MASON UNIVER

PART 2: ANSWERS TO UNESCO'S QUESTIONS ABOUT OPEN SCIENCE

OSI's lessons of experience were summarized in the first part of this document. In this section we will describe how these lessons apply to improving the future of open science. To begin, we will discuss how open science is defined. What are its key tenets, elements and principles? Who is involved and what are their incentives? What are the opportunities and financial considerations? We will conclude by describing our policy recommendations for open science, while also noting the possible shortcomings and unintended consequences of our efforts.

More specific "needs" questions won't be addressed in this section (e.g. best practices in open science and lessons learned, collaboration and networking needs, infrastructure and capacity needs, challenges and how to overcome them), although we would be happy to provide feedback to UNESCO if desired. Since the answers to these questions are all very specific to fields of study, research projects, institutional capacity, and so on, and because these needs are considerable and varied, it is beyond the scope of this summary to provide a full and complete accounting of this information. We suggest that a better approach for UNESCO would be to first inventory all the elements and actors in the open science ecosystem, then evaluate how their needs overlap so economies of scale solutions can be developed.

The same approach should be applied to the open science reform effort in general, not just the needs portion. OSI believes that UNESCO should not prescribe specific solutions at this time, but should instead begin by designing a framework for action that embraces the diversity in this space. What are the open science community's common goals and interests? How can we work more effectively together? How can we, as a vast and diverse community of practice, convey even more benefit to society than now, and work together toward open science goals that lift us all? This is the same point made at OSI2017 by Keith Yamamoto, Vice Chancellor for Science Policy and Strategy at UCLA (as mentioned in part 1 of this paper) with regard to identifying a set of common principles for open science policy reform that define what we want at the endpoint. If we can identify these principles as a group we can then make a broad model that can be adapted or adopted.

OSI believes that UNESCO should not prescribe specific solutions at this time, but should instead begin by designing a framework for action that embraces the diversity in this space.

WHAT IS OPEN SCIENCE?

For policy making purposes, it is important to understand what the term "open science" means. What are policy makers being asked to support and why should they care? Unfortunately, open science means different things to different people. Even the words "open" and "science" defy easy description.

At least four categories of variation exist:

1. **Definition**. Different groups define "open" differently. Because of this, OSI uses an "open spectrum" to visualize the wide variety of open outcomes in the marketplace. These outcomes vary along five dimensions: discoverability, accessibility, reusability, transparency and sustainability (DARTS). Many different combinations of these five dimensions are considered open, not just combinations that are "completely open" (see diagram).

Open isn't a single outcome, unless you mean BOAI-compliant open (but even then opinions vary slightly). What about other kinds of open that are dominating current growth — bronze, public access, and hybrid, for instance? Should we call these open as well (understanding that different people in scholarly communication use the term "open" to refer to different outcomes)? Can we put these outcomes somewhere on a spectrum of open outcomes, because they may be open in several significant respects (e.g., free and easily accessible) but deficient in other respects (e.g., traditional copyright is attached)? OSI hasn't offered to create a new definition of open, but conceptually, the DARTS spectrum, developed by OSI2016 participants and refined at OSI2017, would read something like this: "The open spectrum is the full range of different types of possible open outcomes for information, from completely closed artifacts to open access information and everything in-between. The DARTS Framework holds that the openness of information exists along five dimensions: discoverability, accessibility, reusability, transparency, and sustainability. The result is a broad spectrum of open states. The more easily discoverable, freely accessible, unrestrictedly reusable an information artifact (such as a book, a journal article, a dataset, or piece of code), the more open it is. The DARTS spectrum encourages more openness in scholarly and scientific communication, while also recognizing that open exists in various stages and that in some cases, optimally open may not mean maximally open." The five DARTS elements are defined as follows. DISCOVERABLE: Can this information be found online? Is it indexed by search engines and databases, and hosted on servers open to the public? Does it contain adequate identifiers (such as DOIs)? ACCESSIBLE: Once discovered, can this information be read by anyone free of charge? Is it available in a timely, complete, and easy-to-access manner (for instance, is it downloadable or machine-readable, with a dataset included)? REUSABLE: Can this information be modified? Disseminated? What conditions (both legal and technical) prevent it from being repurposed or shared at will? TRANSPARENT: What do we know about the provenance of this information? Is it peer reviewed? Do we know the funding source (are conflicts of interested identified)? What do we know about the study design and analysis? SUSTAINABLE: Is the open solution for this information artifact sustainable? This may be hard to know — the sustainability of larger, more established solutions may evoke more confidence than new, small, or one-off solutions.

Proponents of open can advocate improving read-only-access to data, read-and-reuse access to print materials, or making journal articles free to read or simpler "freer than now." All support open science, but all refer to different kinds of open outcomes. Achieving these different outcomes involves different policy choices, so our words matter.

2. **Motives**. There are a variety of motives for trying to make science information more open. This variation affects the kinds of solutions we prioritize, and the degree to which our solutions are optimally incentivized and aligned with our community's needs and goals. For some stakeholders in science, their primary motive for doing open science is centered around improving collaboration. For others, it involves increasing interdisciplinary work and discovery, or on improving reproducibility, transparency, accountability, access, or equity.

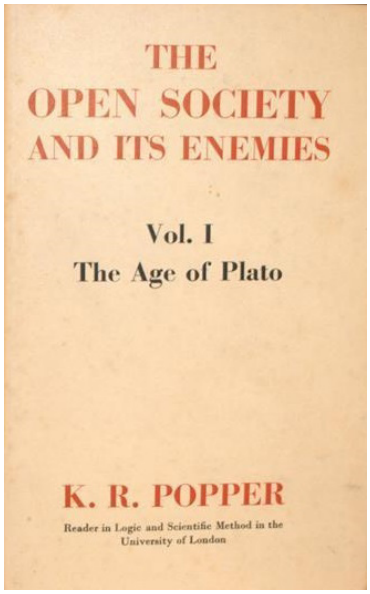
3. **Goals**. Some actors in open science see open as a goal unto itself without identifying specifically what it will accomplish. Some see open as a pathway to achieving particular goals, including specific research and societal goals. And for some, open science is a catch-all phrase like STEM (discussed later in this section), used to describe a future that will cure many of science's problems (e.g., reproducibility will increase, discovery will accelerate, society will gain more value from research, etc.; OSI subscribes to this latter philosophy, but we also support creating the foundation and policies needed to make this philosophy more than just words).

4. **Fields**. The need for open research resonates more strongly in some fields than others—for example, in COVID-19 research as opposed to, say, research into the migratory patterns of certain water fowl. This isn't to say that water fowl researchers don't deserve open science—just that some fields have open science concerns that are more urgent and salient than others (organizations like Research!America, for example, or FasterCures, have a deep interest in opening

medical research). Also, some fields, like physics and astronomy, are already much more open than other fields—norms and challenges vary. And research fields that are not science will inevitably be impacted by reforms to science, yet these fields have unique needs and concerns. One-size-fits-all solutions will not work for all of research.

In searching the stakeholder universe for good "off the shelf" definitions of open science, then, it's important to understand and appreciate this diversity. There is a tendency in some parts of the open community to take a rather narrow view about open science, and this narrowness can blind us all to understanding broader perspectives and make it harder to recognize the challenges and workable solutions in this space.

For background, Nathaniel Tkacz's 2012 essay on the connections between the modern open science movement and Karl Popper's open society theories provides a good foundation for understanding the philosophical roots of diversity in the open science space. These roots run much deeper than the 2002 Budapest Open Access Initiative (BOAI) meeting, which is often hailed as the starting point for "open access" publishing. Open access publishing may have its conceptual underpinnings in 2002, but "open" itself is different—the audiences are different, the applications are different, and the origins are different. Even "open science" doesn't have a singular definition or point of origin—different fields have different needs and applications. What's more, as Tkacz notes, once something is defined as open it tends to become closed—limits emerge with that definition of open, so a new movement emerges to make things even more open. This "fractalization" of open has been happening throughout the history of the open movement, with free societies producing free information, but always never quite free enough.



Karl Popper's *The Open Society and Its Enemies* is one of the more influential books of the 20th Century. Published in 1945 as a rallying cry for liberal democracies under siege, Popper writes at the beginning of his book that "If our civilisation is to survive, we must break with the habit of deference to great men," and also embrace that no single perspective represents the absolute truth. Popper's main purpose was to criticize the totalitarian political influences that had been rocking the world at the time (other books critical of totalitarianism also emerged around this period, like Ayn Rand's *Atlas Shrugged*). Western democracies viewed Popper's work as a reaffirmation of the promose of liberalism—that societies (emulating science as a role model) should encourage rational reflection, and value individualism, equality, and reason, and in doing so will be superior to more closed forms of governance.

There are patterns in this variation that are helpful to understand. Fecher & Friesike (2013) posited that "open science" consists of five broad concerns, or "schools of thought." These are:

- **Democratic school:** Believing that there is an unequal distribution of access to knowledge, this area is concerned with making scholarly knowledge (including publications and data) available freely for all.
- **Pragmatic school:** Following the principle that the creation of knowledge is made more efficient through collaboration and strengthened through critique, this area seeks to harness network effects by connecting scholars and making scholarly methods transparent.
- **Infrastructure school:** This thread is motivated by the assumption that efficient research requires readily available platforms, tools and services for dissemination and collaboration.
- **Public school:** Based on the recognition that true societal impact requires societal engagement in research and readily understandable communication of scientific results, this area seeks to bring the public to collaborate in research through citizen science, and make scholarship more readily understandable through lay summaries, blogging and other less formal communicative methods.

- **Measurement school:** Motivated by the acknowledgment that traditional metrics for measuring scientific impact have proven problematic (by being too heavily focused on publications, often only at the journal-level, for instance), this strand seeks "alternative metrics" which can make use of the new possibilities of digitally networked tools to track and measure the impact of scholarship through formerly invisible activities.

Rebecca Willen has grouped these various concerns into two or three different sub-movements that intersect in different ways, involving open science, replicable science, and "justice-oriented" science (Willen 2020). In this framework, open science is primarily about archiving practices—how accessible research can and should be and how this access can be standardized. Replicable science refers to efforts to improve research transparency and best practices. Many researchers, notes Willen, have an overlapping interest in these two topics, which leads to a hybrid sub-movement of "open and replicable science." Justice-oriented science is a separate wave working for increased social justice—societally, in academic settings, internationally in terms of ensuring that low-resource regions of world are lifted by open reform efforts, ethically in terms of meeting expectations of using public funding for research that equally benefits the "public good," and more. Writes Willen, this has led to confusion in both research and policy:

> It would be great if we could all just stop referring to "open science" when we really mean "replicable science". The only thing these two things have in common is that open science to some extent offers solutions to facilitate replicable science (e.g. public archiving of data and materials). Open science can be open without being replicable, and arguably, replicable science can at least to some extent be replicable without being open."... This confusion has already led and continues to lead to misunderstandings between academics and across disciplines.

Sam Moore (2017) dispenses with categories and posits that because "open" is a rich, varied and disputed term, and because open practices are diverse, the concept of open therefore exists as a "boundary object." In Moore's definition, this means that different communities have co-opted "open" for their own use without also trying to change the meaning of open for everyone, which has both preserved the diversity of open, and fostered different communities of use around this term and spurred local use and development. Fecher and Friesike (2013) see this as a good outcome, arguing that it is better not to rely on a single definition—that doing so "could prevent fertile discussions from the very beginning."

Jon Tennant counters that a lack of common understanding in this space has had consequences. It has, in fact, "impeded the widespread adoption of the strategic direction and goals behind Open Scholarship, prevented it from becoming a true social 'movement', and separated researchers into disintegrated groups with differing, and often contested, definitions and levels of adoption of openness" (Tennant et al. 2019).

Despite all these differences and the rich and varied evolutionary path of open, "definitions" of open science are everywhere. Two of the more recent ones come from the Europe's Open Science Monitor (see EC 2020) and the National Academies in the United States (see National Academies 2018). The EU defines open science as "ongoing transitions in the way research is performed, researchers collaborate, knowledge is shared, and science is organised." The National Academies Open Science by Design deepens this definition by adding that open science attempts to "increase transparency and reliability, facilitate more effective collaboration, accelerate the pace of discovery, and foster broader and more equitable access to scientific knowledge and to the research process itself."

These definitions aren't wrong or ill-advised. But it is important to note they are plentiful and inconsistent. Bianca Kramer and Joroen Bosman created a useful framework (Bosman & Kramer 2017) for assessing the diversity of definitions. In their analysis, they conclude that there are at least five different categories of definitions for open science, including:

1. **Broad definitions** that use selective interpretations (like from the EU and US), to serve as broad open science policy wrappers
2. **Maximal definitions** like the FOSTER Open Science Taxonomy (see the "Elements of Open Science" discussion below) that accommodate all developments that could be relevant to making science and knowledge more open
3. **Practical definitions** that denote a core of concern while leaving room for many different implementations (e.g., the FAIR principles). In practical use on a university campus, open science often is a shorthand umbrella term for many activities (e.g., open licensing of data or posting open access preprints) that stem from many different principles (e.g., transparency, inclusivity, access, social justice).
4. **Personal definitions** that combine many themes and elements from an individual point of view, and
5. **Catchphrase definitions**, like the popular "Open science is science done right."

OSI's core recommendation on the question of defining open science is to recognize that open science is fragmented and fluid, rooted in different understandings of the word "open," a wandering evolutionary path of the open concept, different uptake and adoption by different fields, and different philosophical underpinnings for different audiences. While it may be important to create a concise definition so policy makers can get a general sense of what it is they're being asked to support—and while a nebulous and all-encompassing "definition" may suffice for such purposes —it is also important to recognize that doing so risks creating two sub-optimal outcomes:

1. **Tail wagging the dog**. We've seen this phenomenon in how STEM policies have evolved over the years. STEM represents a wide swath of education and ambition, but exactly how it is used and defined varies widely by audience (from medical technicians to auto manufacturers to computer programmers). The result today is that a broad funding diaspora is attracted to STEM, but there is no global overview regarding what we're doing with all this funding and whether it is achieving its desired objectives—or even a clear understanding of what these global objectives should be (see Hampson 2014). Arguably, this is an acceptable outcome because the STEM acronym has made the promotion of STEM-related education and activities easier. So the lesson learned here may be to develop a workable definition for open science and get the world excited about funding it. This is fine, as long as we maintain some control over the brand and monitor our global progress toward achieving coordinated objectives of open science across a variety of adaptations and audiences. The risk is that we lose this control, and then end up with a hundred different definitions of open science, each funding a different kind of outcome, and having no net impact on the "open science" goals we really care about and need.

It would be great if we could all just stop referring to "open science" when we really mean "replicable science."

2. **Misaligned incentives.** As noted later in this report, many different audiences embrace open science for different reasons. Trying to define open science in a one-size-fits-all way may be fine for policy promotion purposes, but researchers who don't see their interests and passions represented in this definition won't be inspired to join the open science movement, and we won't develop the right kinds of incentives that align their passions with open outcomes.

Bearing these concerns in mind, it may be best to develop (or simply collect for now) a suite of more narrowly tailored definitions for open science—narrow definitions that work for specific audiences, and reflect the specific needs and concerns of different actors and stakeholder groups. These definitions can be refined, with broad stakeholder input, alongside a single "policy framework" definition that embraces the broad uncertainty and diversity in this space.

Finally, we recommend embracing the perspective that a true understanding of open science cannot be accurately communicated by a short definition. Such definitions have their place, and may help promote policy, but they should be used with care when it comes to implementing policy.

WHAT ARE THE MAIN ELEMENTS OF OPEN SCIENCE?

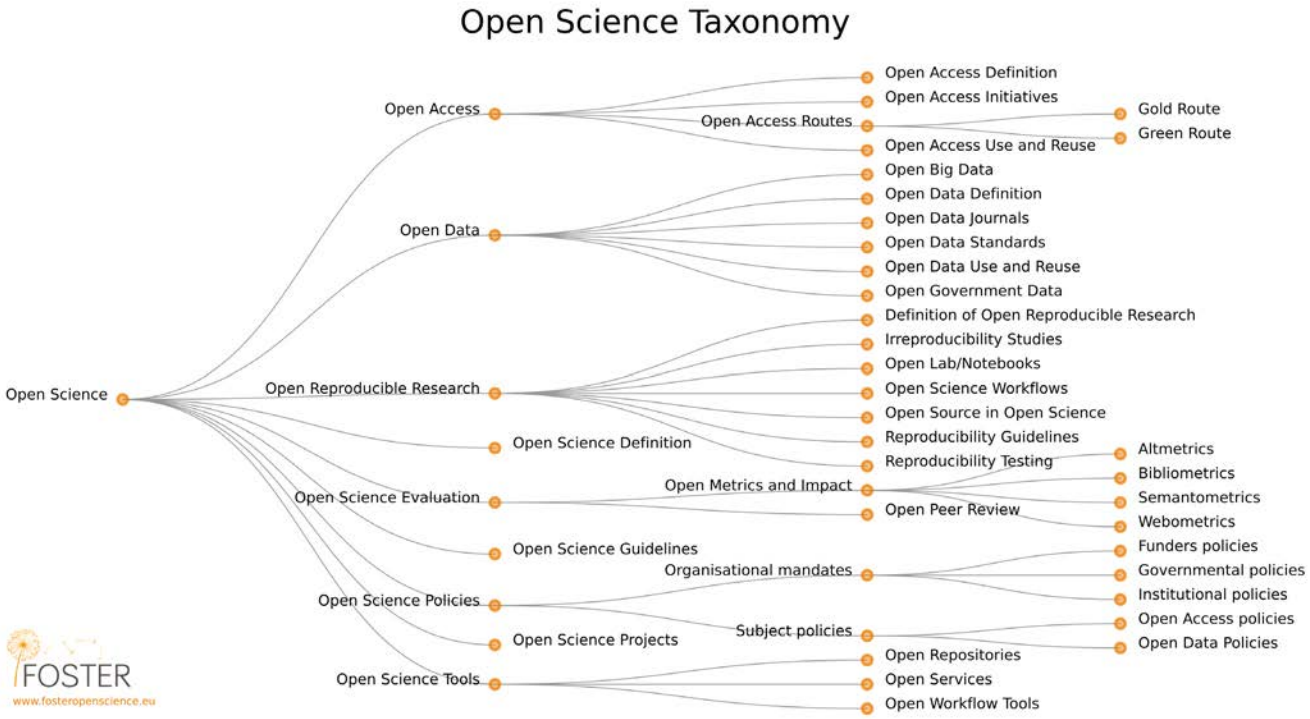
Without a broad, all-encompassing definition of open science, we can't identify all the elements of open science. To some, these elements are centered around improving access. To others, replicability is key. And to others still, social justice is the key element.

These elements are more transactional than the intellectual constructs discussed in the previous section, whereby we see variations in open science by definition, motive, goals and field; by Fecher and Friesike's categories of concern (democratic school, etc.); by Willen's intersecting movements; or as Moore's boundary object. What we see at the transactional level is an a-la-carte adaptation of open science drawing from four main categories of elements: organizing, evidence-based, prescriptive, and practice-based:

- **Organizing elements**: What is your main focus? Improving transparency, replicability, research impact, data flow, access, equity, none of the above, all of the above, or some combination of these elements?
- **Evidence-based elements**: What embargo method works best in your field? What publishing solution works best? What repositories and data access tools are people using?
- **Prescriptive elements**: What are funders and/or universities saying you must do? What solutions are recommended by the open science voices you trust?
- **Practice-based elements**: Open science has developed many areas of practice, as Knoth and Pontika's (2015) widely circulated "Open Science Taxonomy" chart shows (see next page). Each of these areas has its own businesses, users, standards and communities of practice; between these areas, even though there is awareness of each other's existence, there isn't necessarily policy alignment or coordination. This is a rich and diverse ecosystem of practice-based elements.

There is no right or wrong answer here—just observation. From a policy making standpoint, it is important to observe that all these elements of open science are a direct reflection of the many different needs, challenges, concerns and perspectives in the open science space. Understanding these elements can give us a clearer, more practical window into understanding how open science is being defined and used.

Then, from this clearer understanding, we can begin to develop the appropriate policy approaches to open science. Given the diversity of definitions and elements in this space (including, as discussed later in this report, the diversity of actors, guiding principles, opportunities, and more), we should begin to see that —as we note throughout in this report—one-size-fits-all solutions don't work. The global



open science policies we develop can help guide our community toward high-level common ground goals, but to the extent possible, these policies will be more effective, robust, and sustainable if they are driven by the wants and needs of researchers themselves—improving access here, data flow there, transparency and replicability where needed, and so on. Since researchers do not speak with a single voice, we need a policy framework that embraces this diversity, rather than an all-encompassing set of prescriptive policy solutions.

WHO ARE THE ACTORS IN OPEN SCIENCE?

When we try to count the "actors" in open science, it is important to recognize there are many more individuals and groups "acting" in this space than meet the eye. By not recognizing this, we blur the distinction between what we think is happening in open science and what is actually happening. This misunderstanding is further amplified by the fact that some actors aren't necessarily acting *in* open science as much as *with* open science, and by the polarization in the scholarly communication community that has caused some to segregate actors and their actions into "legitimate" and "illegitimate" varieties:

1. **Missing actors**. As discussed previously, there are many different elements and incentives in open science, as well as many different definitions, motives, goals, and fields. A complete census of this population has never been undertaken.[2] Until such time, it is incorrect to equate open access publishing reform with open science; publishing is just one part of the open science equation. This publishing-centric perspective becomes even more inaccurate when we note that most of the major discussions about open access have been dominated by only a few voices—chiefly a handful of funders, prestigious Western universities and library systems, and a few large commercial publishers. Many actors within these stakeholders groups

2. This would be an interesting and worthwhile project. The census could be done by field, and the results from each field could be overlaid to look for areas of common expertise, focus, interest and so on.

are unrepresented in these discussions, and many stakeholder groups are missing entirely. For instance, researchers aren't involved in any meaningful way, and many other major stakeholders, including the general public, have no voice and no power. Also generally absent in any coordinated sense have been smaller research universities and universities from lower income countries, as well as scholarly societies, university presses, non-university research institutions, government funders, and many other stakeholders.[3] In OSI, our main organizing principle has been that all stakeholders in the open movement need to be heard. We believe that only by working together will we be able to understand the scholarly communication landscape in a way that allows us to find common ground and build a truly sustainable foundation for open reforms on this common ground. OSI has identified 18 major stakeholder groups in all. Their participation in OSI is as follows:

Stakeholder group	Participants (Dec 2019)	Percent of OSI group
Research universities	56	14%
Libraries & library groups	51	13%
Commercial publishers	39	10%
Open groups and publishers	37	9%
Industry analysts	36	9%
Government policy groups	35	9%
Non-university research institutions	21	5%
Scholarly communication experts	20	5%
Scholarly societies	19	5%
Faculty groups	16	4%
University publishers	16	4%
Funders	14	4%
Active researchers	9	2%
Editors	8	2%
Journalists	6	2%
Tech industry	5	1%
Infrastructure groups	3	1%
Other universities	2	1%
Elected officials	1	0%
TOTAL	394	100%

The individuals invited to participate in OSI are mostly high-level leaders from scholarly communication stakeholder groups like commercial publishers, government policy organizations, research universities, libraries and library groups, non-university research institutions, and private and public funding agencies. The idea behind this VIP club is to shorten the telephone cord—to have direct conversations between decision makers in scholarly communication so the obstacles to reform can be overcome more easily. In all, about 450 leaders have participated in OSI in some capacity since 2015. Not all 450 engage regularly with OSI, or currently, or at the same time, or even at all, which is why we refer to this group as "participants, alumni and observers." See the OSI website's "participants" page for more details. See the Annex section of this report for a list of OSI participants, alumni and observers.

While this isn't a perfect grouping, our intent was to include more people at the center of this conversation who are best positioned to resolve current sticking points—universities and publishers—and also include a robust mix of voices from other key players who must contribute to a global vision of what the future of open science should look like in order for this vision to be workable and sustainable. There have been problems with OSI's mix. For instance, we don't

3. A few dozen government funders and major foundations have made hugely influential forays into open science by creating open research mandates—the US National Institutes of Health (NIH), the Wellcome Trust, Gates and others. But to date there has been no large scale coordinated action between these funders to shape the future of open science, with the exception of cOAlition S (which has stalled for now at 13 funders, mostly from the EU; also, cOAlition S funders have been acting without consulting the full scholarly communication stakeholder community). At the international level, all these funders have been acting independently, not as participants in a global conversation to reform open scholarship but as independent actors making reforms affecting their research grant recipients.

have a good understanding of what universities think, because more often than not provosts ask libraries to take the lead on this issue, and the interests of libraries can be different from the interests of provosts' offices or their institutions more generally; even in a diverse group like ours, it's the people who speak who are heard (and not everyone speaks); and researchers are underrepresented (not only in numbers, but diversity—researcher opinions about open science and about the needs and challenges in this space vary widely by age, career stage, field, research institution, and world region). Still, even with these shortcomings, OSI is the world's only standing, large, diverse, high-level body working on open science reform. Our lessons of experience will be helpful in creating a body tasked with creating global policy on this issue.

2. **Acting in versus acting with.** As stated earlier in this report, we need to bear in mind that many different people and groups are acting in this space without necessarily considering their work to be in furtherance of open science per se. Because open science isn't clearly defined, we can't say that party X is an actor in open science but party Y is not. Different people and groups have different definitions of open, different motives, different goals, and are working in different fields. We can, in a very broad sense, consider all of these different people and groups to be working together for open science, but many are marching to the beat of a different drummer. Some may see themselves as being part of the same marching band, many may not.

3. **Polarization**. There is a significant amount of distrust in the scholarly communication reform arena, which has grown from years of infighting over how open should be defined, by whom, and who should (and shouldn't) control the future of open. Open movements in general have been susceptible to this dynamic—it isn't just the open science movement that has fallen prey (see Chait 2007 for instance, although much more has been written on this dynamic; the general sense is that open movements all tend toward solutions that reject capitalism, treat dissent as betrayal, and urge the masses to rise against oppression). From this distrust has sprung a culture of unilateralism, where many posit that it doesn't really matter what everyone thinks because not everyone matters and the right kind of change won't happen with everyone involved. This culture of unilateralism has also produced an open science reform movement marked by "exclusive" partnerships between like-minded groups to achieve objectives that will affect far more than their immediate sphere of influence. This polarization fuels issue number one regarding our open actor "census"—we aren't all necessarily seeing or counting the same groups of people.

In summary, there are a great many actors in open science, not necessarily working in unison and not necessarily showing up on our normal counts of who is involved. OSI's recommendation is to engage all of these groups in policy discussions, not just the ones we usually hear from. Of particular interest to us and to UNESCO is to engage researchers more effectively in this effort, and also to ensure that we build a stronger bridge between the public and science, thus enabling an environment where we can transfer the benefits of science to the public more effectively than now.

WHAT ARE THE GUIDING PRINCIPLES FOR IMPLEMENTING OPEN SCIENCE?

It's important to remind ourselves that science is, by design, already one of the most "open" undertakings in the history of humankind. Science requires openness to succeed and progress. What we are discussing "implementing" here is how to define and create "more" openness in science in order to confer more benefits to science and society. Our guiding principles for this implementation, therefore, need to be designed with care and humility. We aren't necessarily working to fix something that is broken (although some view science this way), but to help bring the communication norms and processes of all science everywhere into the 21st century while at the same time benefiting science.

OSI has identified three basic categories of guiding principles that might be useful to consider: strategic, philosophical, and outcome-based. UNESCO may have a preference for one approach over the other in developing its open science policies, or may prefer to synthesize its own approach from all three categories.

STRATEGIC

In terms of strategic guiding principles, OSI has developed 12 for open science implementation. These principles are part of OSI's Plan A, which is described in more detail later in this report. Plan A is a synopsis of the main themes and recommendations that have emerged in OSI during this group's examination of the scholarly communication landscape. These 12 guiding principles are as follows—that inclusive, effective, sustainable open science policies intended to benefit all researchers everywhere must be:

1. **Researcher-focused.** Research communication tools, services and options need to be developed with heavy input from the research community, with solutions and approaches driven by researcher needs and concerns. In this case, where are the needs and gaps in current practices related to open science? For instance, where are the current data sharing needs most urgent, and what are the roadblocks to wider use and uptake (e.g., systems, standards, etc.)?

2. **Collaborative**. Successful and sustainable solutions will require broad collaboration, not just to ensure that all perspectives are considered, but also to ensure there is broad ownership of ideas.

3. **Connected**. There are a great many interconnected issues in scholarly communication. We can't just improve the openness of information without also addressing issues such as impact factors, peer review, and predatory publishing. Reforming scholarly communication will require a systemic approach.

4. **Diverse and flexible**. There are no one-size-fits-all solutions to scholarly communication reform. Instead, there are many different pathways to reform, likely including many that have not yet been conceived or deployed. Diversity, creativity and flexibility in this undertaking should be encouraged, at the same time noting that we should try to maximize adherence to the other principles represented here.

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5. **Informed**. We need a better understanding of key issues in scholarly communication before moving forward. For instance, what is the impact of open research? The more accurate and honest our assessments, the more accurate and honest our reform efforts can be, the easier these efforts will be to promote, and the more successful they will be.

6. **Ethical and accountable**. We need enforceable, community-developed/driven standards to ensure the integrity of journal publishing, repositories, and other related activities/products, and to ensure that unethical approaches are not embraced.

7. **Common goal oriented**. We must discuss and plan for what the future of scholarly communication means, beyond just having access. For instance, we need to identify precisely what we

plan to do with open information, where we will need data interoperability, what tools and procedures we will need to achieve this interoperability, and so on. By doing this, we focus on and strive for our community's common goals.

If we can identify principles as a group we can then make a broad model that can be adapted or adopted. (Keith Yamamoto, OSI2017)

8. **Equitable**. Researchers everywhere need to be able to access and contribute content to the global body of research information with minimal barriers. To the extent practicable, research information—particularly information central to life and health—should not be unreasonably constrained by issues such as high access costs, poor journal indexing, and a lack of capacity-building programs.

9. **Sustainable**. Scholarly communication reform approaches need to be sustainable, which flows from all the other elements in this list. That is, the reform solutions we design need to be achievable, affordable, popular, effective, and so on.

10. **Transparent**. This community needs to maintain as much transparency as possible in this effort (with regard to pricing, usage, ownership, and so on) in order to address the trust issues that have plagued this space for so long.

11. **Understandable and simple**. This community needs to agree on a few simple, high-level, common-ground goals for scholarly communication reform—not anything specific with regard to publishing requirements, for example, but a general set of goals that are understandable, achievable, and adaptable. By setting out general goals that can be easily achieved, participation can be made simple and easy, with low barriers to entry.

12. **Beneficial**. In the end, these reforms need to benefit research first and foremost. While the argument to improve benefits to society is central, these benefits need to be matured carefully, deliberately, and realistically in order to ensure that societal benefits are indeed being conveyed as intended, and that research is not being harmed in the process.

PHILOSOPHICAL

Philosophically, the guiding principles developed by the Open and Collaborative Science in Development Network (OCSDNet) offer a broad, inclusive, justice-oriented framework that is entirely consistent with OSI's inclusive approach and might be adaptable to UNESCO's purposes. On its website, OCSDNet states "we learned that there is not one right way to do open science. It requires constant negotiation and reflection, and the process will always differ by context. But we also found a set of seven values and principles at the core of their vision for a more inclusive open science in development." OCSDNet's guiding principles state that open and collaborative science should:

1. **Enable** a knowledge commons where every individual has the means to decide how their knowledge is governed and managed to address their needs

2. **Recognize** cognitive justice, the need for diverse understandings of knowledge making to co-exist in scientific production

3. **Practice** situated openness by addressing the ways in which context, power and inequality condition scientific research

4. **Advocate** for every individual's right to research and enables different forms of participation at all stages of the research process.

5. **Foster** equitable collaboration between scientists and social actors and cultivates co-creation and social innovation in society

6. **Incentivize** inclusive infrastructures that empower people of all abilities to make, and use accessible open-source technologies.

7. **Strive** to use knowledge as a pathway to sustainable development, equipping every individual to improve the well-being of our society and planet.

OPERATIONAL

Before detailing OSI's operational perspective on the guiding principles for open science, a bit more explanation is needed. Specifically, there are many actors in the open science space, as discussed, who are already working on a wide variety of open science implementation plans, with or without detailed guiding principles that take into consideration the larger open science arena. In addition to understanding how the global science community should approach this task, members of that community must also understand how these individual and collective actions will integrate with this existing universe of actions. This, too, is an important operational open science implementation principle.

But how should this integration happen, and why?[4] There are many brilliant and passionate experts in this community who believe that working together on common ground to achieve long-range common goals is a mirage—that only limited or unilateral actions will lead to global open reforms in the near future; or that global action has no chance of happening so it's better to take what we can get; or that global action will only achieve "watered down" open that doesn't immediately satisfy our most ambitious plans.

Broadly speaking, the difference in guiding principles between those who believe in the common ground approach and those who don't is the difference between inclusive or exclusive principles—inclusive if the goal is to reach a broad, global, sustainable agreement; exclusive if there is a belief that narrow, focused efforts are more practical, desirable and/or achievable. In the international scholarly communication community today, there are a large number of exclusive arrangements—from bilateral agreements between universities and publishers; to government mandates for domestically-funded research; to coordination between similarly focused advocacy groups or infrastructure groups (like those working to improve institutional repositories or editorial standards). These efforts are in addition to a vast multitude of unilateral reform efforts, from institutions creating their own one-off open access policies to publishers launching new open products and services to new business ideas emerging featuring new approaches to peer review management (like F1000), preprint standardization (using a framework created by the Center for Open Science), the brilliant SciElo network in South America (whose origins actually predate the open movement but which is constantly updating itself to stay robust and cutting edge), and more. This constellation of passion and energy in this community to improve the future of open is truly something to behold.

So why not just adopt exclusive-oriented guiding principles? Because this community's effort to reform open research has for decades now been working backward from these exclusive, unilateral and/or specific solutions, trying to defend them, rationalize them, and/or knit them together. By design or circumstance, however, these solutions are often rigid and inflexible, meaning that integrating them—most often as an afterthought—into a tapestry of policies and solutions that work for broader audiences becomes effectively impossible. There has never been an inclusive, global effort to bring everyone together first—broadly, at scale and at a high, policy-making level—to identify common ground

4. The remainder of this essay on guiding principles is copied from OSI's Common Ground paper (Hampson 2020).

needs and interests, then collectively brainstorm options, and only then design specific policies and solutions that work within this globally operational and sustainable framework.

Our failure to work like this, systematically and as a community, on the global issues and challenges of scholarly communication has led to a unique twist on the tragedy of the commons, where it isn't our inaction on common challenges that has led to problems, but the fact that we continue to act on these challenges in our own interests, or from our own limited perspectives, or with the sense that this is the best we'll be able to do. Of course, practically speaking, taking a broad global approach to scholarly communication may not even be practical or prudent if large stakeholders—think the EU or the University of California system—are of the mindset that they have a legal and fiduciary obligation to do what's best for their constituencies and not worry about the rest. But in this case, "the rest" can end up meaning the majority of the scholarly communication world that doesn't have the power to craft such sweeping publishing agreements. And when those large players do make changes that they feel are in their best interests, the impacts of those changes rarely are confined to the organizations who made them. The changes instead cause ripple effects throughout the scholarly communication environment. This isn't so much of an issue if we're certain these ripple effects will have positive impacts. We don't know this, though. We do know that impacts are rippling everywhere. Where the system finds a new equilibrium is anyone's guess as well as whether this new equilibrium is better or worse than before (for everyone).

This exclusivity and the resulting lack of inclusivity of ideas about the future of open has been perhaps the defining deficiency of most of the collaborative actions that have happened in our community to-date. Most of the discussions about open reforms have just involved libraries, publishers, a few funders, and a few active scholars, and have revolved around what open means and what policies we'll need to get there from here. But there are many other facets to this conversation, and many other stakeholders affect and are affected by changes in the ecosystem—the scholarly communication ecosystem differs in significant ways across the globe and between researchers, institutions and fields of study—and there are many questions that exclusive action can't address. Issues aside, there are also broader ecosystem-level questions that need answering, such as what is our collective goal in pursuing open policies? What are we going to do with this information we're collecting (and why)? Who is asking and answering these questions and are we sure the questions and answers we're providing (via our narrow group of debate participants) actually represent the best interest of global research and global researchers?

There has never been an inclusive, global effort to bring everyone together first—broadly, at scale and at a high, policy-making level—to identify common ground needs and interests, then collectively brainstorm options, and only then design specific policies and solutions that work within this globally operational and sustainable framework.

To be clear, the scholarly communication community's limited and exclusive groups have collaborated over the years with vigor and success. There has been broad cooperation and collaboration between aligned interest groups, advocacy groups, groups with similar regional interests, groups with similar ideological bents and so on. This kind of cooperation and collaboration has helped push forward progress on open and raise the profile of the need for open. Also, going back again to Moore's boundary object phenomenon as discussed earlier (and also noted in Şentürk 2001), there is power in the fact that different parts of the scholarly communication community understand and adopt their own understanding of openness in different ways depending on their norms and processes. So, neither of these dynamics—limited engagements or a variety of adoption paths—should change.

What is missing is that it's unlikely only limited engagement and/or varied adoption paths will ever by themselves result in broad and comprehensive solutions to scholarly communication's systemic issues. And these dynamics certainly won't result in off-the-shelf global, universally-acceptable solutions or solutions that work for groups whose needs differ from those of the negotiating groups. It's hard to envision a system more global and more integrated than research. Global approaches are needed.

This is precisely why, considering what's at stake, it is so critically important that we put our differences aside in this community and summon the will to look thoughtfully and carefully at how we are approaching the common challenges we face. Are we certain our current exclusive efforts are truly the best we can do as a community or are some of our approaches more expedient than thoughtful, inclusive, robust, effective and sustainable? And if they are more expedient then we need to ask ourselves whether these shortcuts are wise. The potential that an open future holds for research and society is vast. It behooves all of us to work together to develop this future the right way. Exactly how we do this is the question we should be trying to answer. OSI's Common Ground paper goes into this discussion in more detail.

To get there from here, OSI participants have developed operational guiding principles to supplement our strategic perspective. The high-level version of these principles is that four main beliefs define the common ground in this space: (1) Research and society will benefit from open done right; (2) Successful solutions will require broad collaboration; (3) Connected issues need to be addressed; and (4) Open isn't a single outcome, but a spectrum. These four beliefs are a summation of the nine operational beliefs that OSI2017 participants identified:

1. **Open isn't binary**. The terms "open" or "open access" (OA) are used in a wide variety of ways. Therefore, we need to keep the DARTS spectrum in mind (as described earlier) and recognize that when different groups support open, they may be supporting entirely different open outcomes.
2. **Open isn't free**. The focus of open cannot be only about cost-savings. Open is going to cost money—we aren't sure exactly how much (see the financial discussion later in this document).
3. **Open isn't easy**. Achieving open outcomes can be complicated. The easy solution isn't necessarily going to be the correct solution.
4. **Publishing is critical.** Without publishing, there is no modern, reliable scientific record. This isn't to say that publishing as it currently exists is infallible or indispensable, just that we need to make changes with care and respect for the vital role that publishing plays in research.
5. **We're more alike than unalike**. There are wide differences of opinion in this community but also significant overlap in our perspectives.
6. **Convergent needs are everywhere**. Convergent needs and aspirations are everywhere in this community. This can be difficult to recognize when we spend most of our time arguing about what color of open access is best. From a high level, however, this convergence is obvious.
7. **We need more information**. There are significant gaps in our community's understanding of many key issues in scholarly communication. More study is needed.
8. **Accountability**. We all have a stake in the outcome.
9. **Trust**. This conversation needs trust to move forward. There is a lot of mistrust in the scholarly communication system, which has been so polarized for so long.

WHAT OPPORTUNITIES EXIST FOR OPEN SCIENCE?

If done correctly and collaboratively, the global research community can foster a culture of open research wherein open systems are diverse, integrated, robust and sustainable, and where incentives are aligned so researchers will flock to open because doing so benefits their work and their careers.

How do we get to this future? Step one is to find common ground—to develop and embrace an approach to this future that truly celebrates the diversity of thought in the open space. With this approach, we have an opportunity to build on our common aspirations, foster connections and collaborations across philosophical divides, build systems that facilitate more and faster open uptake, tackle real-world open challenges (like improving access to climate change research), and improve open outreach.

OSI's Common Ground paper (Hampson 2020) details reasons why this community must find common ground; OSI's Plan A details what this community's common ground action plan can look like (there are several other key open roadmaps under development, of course, including UNESCO's; Plan A can be an "on-ramp" to these plans, operating either as a prequel to or in parallel to these plans, and isn't intended to be a terminal plan operating by itself).

The concluding appeal from this document is that the need is real and urgent to find new, more exciting, more rewarding ways to develop open science, to build tools now that begin to deliver on some of the promise of open, and to start focusing now on what open can do so we can help the open movement grow by example and incentive instead of by fiat.

How is all this different from our current approach? It's different because there are no policy agencies and instruments in the open movement today that incorporate a truly diverse set of views and perspectives. Instead of relying on one-size-fits-all approaches and solutions to open powered by ideology we can create an inclusive open movement that is informed and empowered by diversity and opportunity.

In terms of timing, we can begin by picking the low hanging fruit, working together on common ground solutions to the easiest and most pressing issues. Doing so will build a record of success, build confidence, and attract more institutions to this approach. After five years we can move on to tougher issues, like reforming our use of the journal impact factor, improving promotion and tenure systems, and raising the bar (significantly) for data inclusion and interoperability and repository function. After 15 years of working together, what does this full potential look like (Hampson 2018)?

- Open is clearly defined and supported
- Open is the standard output format
- Open solutions are robust, inclusive, broad, scalable and sustainable
- Almost all knowledge is discoverable
- The global access gap is nonexistent
- Solutions for the humanities are built-in
- Connected issues are resolved
- Incentives are aligned so scholars embrace open because they want to
- Open is simple and clear so scholars know what it means and why they should do it
- Predatory publishing is defeated so it no longer threatens knowledge integrity
- Standards and global guidelines are clear for all journals, which helps the market
- The marketplace remains competitive so open products remain cutting edge

- Repositories are integrated, not just connected
- Data standardization is widespread and robust.

All of this can lead us to an Open Renaissance, where many kinds of improvement happen to research, the research ecosystem grows exponentially more powerful, new fields and directions emerge based on easier and more robust interdisciplinary work, funding efficiency improves, and discovery accelerates. The social impacts of research surpass today (including improved literacy, public engagement, and public policy impact), knowledge becomes more of a global public good, and society reaps the benefits.

By contrast, continuing with our current go-it-alone approach may eventually result in competing regional solutions where we end up with one open future for China, another for the EU, and still other futures for South America, Africa, and other regions, each working to solve its own unique concerns and perspectives. This approach may also force changes across diverse disciplines that may not work well (for example, open solutions that work in physics generally don't work at all in history), causing researchers in some fields to lose interest in an open future. Or it may lead to unintended consequences that don't necessarily benefit research, again causing a drop in interest (see the "Unintended Consequences" section later in this paper).

The go-it-alone approach also fails to address the growing concerns in government that there are intellectual property and security ramifications of a vastly more open research world (see Poynder 2019 for a lengthy list of examples)—not just sharing data freely but collaborating on research projects and even allowing certain foreign nationals to study at certain universities. Can we proactively address concerns like these by working together more effectively, or do we wait and react to future legislation that directs researchers to collaborate and share on the basis of nationality rather than merit?

There are larger, distinctly modern currents at work here that have the potential to utterly reshape our answers to the many questions posed by open research. If we work together, our ability as a

community to deal with these currents will be informed, unified and strong. If we are a fractured community, however, where every country and stakeholder group is just in this for their own benefit and is pursuing their own national agenda and vision of the future then there will be no bulwark against these nationalistic tides and the global effort to make research more open may suffer as a result.

In summary, we have an opportunity to develop a bright and robust future for open science. We also have an opportunity at this juncture to prevent the many actors in this space from simply arguing away the future of open science. Powerful reasons exist for working together as a global community on the many challenges of open research— from a wealth of common ground interests to a need for common ground solutions to systemic problems; from making open research more attractive and coordinated, to aligning incentives, removing obstacles, better understanding national needs and interests and charting a course for a much more exciting and robust open future.

Still, there are those in the scholarly communication community who disagree with the necessity or desirability of this approach—experts who believe limited solutions are the best we can hope to achieve; open advocates who think trading one evil (like subscription prices) for another (like author fees) will produce the greater good; or observers who believe our disjointed system as it's currently evolving will eventually get us to the desired outcome without the need to deliberately seek broader solutions. These perspectives are all valued and valuable. Many such perspectives inform this debate—there are no black and white answers. Indeed, there are a wealth of questions that have no answer at all.

And this is precisely why, considering what's at stake, it is so important that we put our differences aside in this community and summon the will to look thoughtfully and carefully at how we are approaching the common challenges we face. As mentioned a few pages ago in the "Guiding Principles" section, are we certain our current efforts are truly the best we can do as a community or are some of our approaches more expedient than thoughtful, inclusive, robust, effective and sustainable? It behooves all of us to work together to develop the future of open science the right way. Exactly how we do this is the "opportunity" question we should be trying to answer.

WHAT ARE THE INCENTIVES FOR OPEN SCIENCE?

There are three categories of open science incentives UNESCO should consider, in this order of priority:

4. **Science-related.** As Elizabeth Gadd has noted (Gadd 2018), "Quality and openness are two completely separate things, and we do researchers and research a disservice if we confuse the two." Openness can improve the quality of science by enhancing rigor and reproducibility, but openness is not the only route to improving quality. Our highest priority should be to incentivize improving the quality of science, using open science methods where applicable, and allowing researchers to flock to open science because it works better, not because they're being forced to do so (here again, one-size-fit-all approaches simply don't work).

5. **Resources-related.** Effective open science tools such as high-quality open journals and open datasets can improve the visibility of science by making research more accessible, and by improving engagement with outputs. Not all researchers everywhere have equal awareness of or access to these kinds of resources (from APC funding for open access publishing to universities with open data repositories). Improving the quality and availability of these resources will be a magnet that incentivizes and enables more involvement in open science.

6. **Participation-related**. Only after we've focused on these first two priorities should we worry about incentivizing more researchers to participate in open science via metrics (see EC 2018,

for instance), outreach, mandates, and so on. A robust, effective, egalitarian open science framework will speak for itself. Once we're at this stage, reaching out to scientists who need help will be effective, but not before then. Indeed, trying to incentivize participation before then may backfire. In a nutshell, policy can drive practice, and better practices can enable policy, but in either case, encouraging more participation (and using metrics to measure how we're doing, and even attaching requirements to participation levels) should come last (or arguably, never).

"Quality and openness are two completely separate things, and we do researchers and research a disservice if we confuse the two."

In addition to recognizing that there are different priorities and categories of incentives, it's also important to note that each of these incentives regimes varies by country, funder, institution, career stage, field, and even specific area of study. The complexity of this mind map far exceeds the scope of this paper.

So, just as the "needs" issues aren't being addressed in this paper because of their vast diversity (e.g., issues such as the infrastructure needs of open science), so too a truly comprehensive set of incentives recommendations would be very involved. These incentives aren't only about open access publishing, but about how science itself is incentivized across all fields, institutions, and regions, from researchers at all manner of career stages, in response to pressures ranging from funder mandates to university pressures to races for discovery. OSI has discussed the incentives of open science, but mostly with respect to such observations as the need for better outreach and education, easier and clearer standards, specific and workable open solutions, and so on.

Finally, it's also important to note that openness is not the only route to improving science, and it is not equally embraced by or available to all researchers everywhere. But it is an important approach, and has much potential, so it is in this context that we think it's valuable to offer a few limited observations on how to improve the incentives in open science—not with regard to how all incentives everywhere can be improved, but for how the incentives to participate in the publishing-related aspect of open science can be improved. These incentives don't always align with "traditional" science. The areas of misalignment are where we need to focus our attention. Because they aren't aligned, we need to develop policies that will help us achieve more open science without also expecting researchers to take actions they may not currently see as being in the best interests of their research or careers.

The following table summarizes some of these intersections. The items listed here are merely illustrative of the diversity of incentives in open science:

Incentive	"Traditional" approach	Open science approach	Conflict	Resolution	Policy reform trajectory
Promotion and tenure	Publish or perish—publishing more is better, and higher "impact" journals count for more	Published findings may be one indicator but the availability of data, software, protocols are equally important, as is adherence to reporting standards such as PRISMA and CONSORT.	Early career researchers are most susceptible here. They need to play the game in order to get tenure. When the goal is to be published in the most prestigious journal then traditional subscription journals are often the venue of choice.	Continue working to change the perception of quality based on the publication venue (e.g., by moving away from impact factors) and introducing new promotion and tenure guidelines based on Open Science expectations.	These are all long standing problems, but the tide is turning through increased adoption of DORA. The Netherlands and Finland have, for example, introduced new national approaches to researcher assessment based on broader quality criteria, and China is now banning the assessment of quality based on SCI-indexed journals.

Incentive	"Traditional" approach	Open science approach	Conflict	Resolution	Policy reform trajectory
Secrecy	Competition in science often means keeping research under wraps until results are final, in order to ensure the right people get credit for discovery, and also so the discoverers can capitalize on their discovery.	Open Science prizes a more transparent and collaborative approach. However, priority can be established through the pre-registration of research and the early publication of findings through preprints.	Scientists aren't always in a position to do this (because of private funding, for instance), nor would they necessarily want to do this, although expectations are changing. This complexity is often overlooked or dismissed; it's a much simpler assessment for some researchers than others. The factors involved here aren't just altruism, but are more structural in nature.	To-date, this issue hasn't been adequately explored.	COVID-19 has challenged the secrecy of science in unprecedented ways and many are predicting this will open up new forms of cooperation and sharing going forward.
Getting credit for discovery	This is a central function of science publishing—time-stamping discoveries to establish who was first. This can be done through a journal, a letter, a preprint, a conference paper, or other methods	As above, open science provides new opportunities for establishing priority over ideas and for getting credit for them. (see below)	The secrecy tensions mentioned above are an issue. But otherwise, open science options (like preprints) expand the choices that authors have for getting published quickly.	Open science inherently allows for a more transparent look at the evidence for who should be credited with discovery by revealing more of the process of science and not just focusing on the formal publications that result.	Greater use of the CRediT – Contributor Roles Taxonomy to document contributions throughout the process of science.
Citing the work of others	Researchers need to give credit where credit is due. This not only allows credit to accrue, but credibility to accumulate around more solid ideas.	Open science practices give researchers a far wider range of opportunities for receiving credit for their work, through pre-registration, data citation, method re-use or Github forks (software).	Open work is read more often, and the citation rate for most kinds of open science articles is higher than for "closed" articles.	Open science provides many possibilities here, from increasing the range of scientific outputs available for citation, comment and re-use to having more effective dissemination, which enhances such re-use, and the possibility for better output-level indicators.	Policy reforms around next generation metrics for open research and responsible research evaluation practices provide many opportunities for reviewing what we value in research.
Research integrity	This is a fundamental principle of science although not supported by traditional practices which incentivize secrecy and the speedy publication of 'sexy' results, and the inability to publish null results.	Open science advocates for increased quality through practices like better transparency and replicability.	Transparency and replicability are noteworthy efforts and have produced noteworthy insights and progress in science. While some may say that open science publishing is more susceptible to fraud and abuse, it is also more open to detection and correction. COVID-19 preprints which were quickly disproven were removed from circulation in 48 hours.	There are considerable moves afoot to improve reproducibility and research integrity such as the UK Research Integrity Concordat, and the Reproducibility Network.	Initiatives such as the Hong Kong Manifesto for Research Integrity seek to assess researchers according to their engagement with Open practices that are indicative of research integrity.

The National Academies Roundtable on Aligning Incentives for Open Science (see NAS 2020) recently produced a report that outlines two key areas for reconciling these conflicts: modifying promotion and tenure guidelines to include more activities that are representative of open science practices; and promoting culture change through shared values, with senior researchers leading by example. OSI concurs with this conclusion. OSI2016 and OSI2017 delegates identified the culture of communication in academia as the single biggest barrier to change, and also the barrier that will be the most difficult to surmount. Our conclusion is that this culture will not change by fiat, or through one-size-fits-all

solutions, but only over time through an accumulation of evidence and infrastructure that makes open science a clear choice that aligns with the best interests of researchers and their work. Open science needs to become something that researchers want to be involved in; it will never reach its full potential as a "requirement" that researchers are told to obey.

Elizabeth Gadd (Gadd 2019) puts it succinctly this way, that in order to move toward open practices, academics need:

1. **Understanding**. Why is this important?
2. **Capability**. How do I actually do this?
3. **Opportunity**. Where can I do this?
4. **Motivation**. What are the benefits or who's going to make me?

"If we get 1-3 right," says Gadd, "number 4 might not be needed at all. Think about recycling. We all understood why recycling was important, and we all knew where the bottle banks were. But most of us didn't recycle regularly until the local council provided us with a bin in our front yard. Once that was available, we didn't need recycling rankings, or a field-weighted-recycling-index to motivate us. We just did it, because it was easy."

So, part of the evolution of the open science incentive system will require continuing to develop the capabilities of open science; part will require continuing to develop open science resources; part will involve more open outreach and education; and part will involve making open easier, even to the point where not doing open violates social norms or becomes a research disadvantage.

Part will also involve taking a more thoughtful approach to understanding the many ways that open science has been interpreted and adopted in by different audiences. Recalling Fecher's five schools of thought on open science (democracy, pragmatism, infrastructure, public and measurement), it's clear that even this grouping of incentives isn't black and white. For every incentive group, there are both proponents and opponents. The following table explores just a few of these relationships. Here again, this table is only meant to be illustrative, not exhaustive:

Open means...	Outcome	Pro stakeholder	Incentive	Con stakeholder	Incentive
Democracy	More equitable global distribution of knowledge. Free access, so more people can read research.	Researchers, policy makers, public	For the public and many global researchers, cost is a barrier to access. The current costs of access and solutions to improving affordability are increasing the divide between haves and have-nots. For researchers, being able to share their work widely is a top priority.	Policy makers, publishers, scholarly societies	Solutions whose goal is to improve access in lower resource regions need to be designed with these regions in mind. We can't take Eurocentric solutions and make them fit globally. Some of these solutions also threaten the financial viability of publishers and scientific societies.
Pragmatism	Better replicability and transparency mean stronger science	Researchers, funders, policy makers, public	Open can lead to a robust body of knowledge, more opportunities for collaboration and discovery, better targeting of research funding, and more efficient and effective spending.	Researchers	One-size-fits-all solutions are the enemy here. There is much benefit to be gained through tailored approaches.
Infrastructure	Better awareness, dissemination and integration of research and data	Researchers, funders, public, infrastructure groups	There are a wide variety of infrastructure needs across a wide range of open science groups, from better indexing to better repositories and better discovery tools.	Researchers	Again, one-size-fits-all solutions don't work here. Mandates requiring solutions like university repositories are largely unfunded and ineffective.

Open means...	Outcome	Pro stakeholder	Incentive	Con stakeholder	Incentive
Public	More public engagement and involvement in science	Public	Who "owns" knowledge? Shouldn't all publicly-funded research be available for the public to read and use? The public approach values citizen science, readable science, and more "ownership" by the public.	Researchers	Research shouldn't necessarily be promoted in ways that exaggerate findings and distort funding priorities. More public involvement is great, but public misinformation is also an outcome.
Measurement	Better indexing and evaluation	Researchers, universities	There is huge resentment in many parts of the research community toward the role of impact factors in academia, and yet an understanding that has historically been how the game is played.	Publishers	Impact factors are seen as a useful metric. There is a view that we cannot stop using these without first agreeing on something better.

In addition to acknowledging this complexity, it's also important that we carefully examine our assumptions that some of the potential benefits of open science reform we often casually mention are actually seen as incentives by researchers, rather than as hyperbole. This isn't to say we should be timid or pessimistic about our vision for the future of open science, but rather bold and realistic. OSI has taken a leap of faith that open science should be pursued with full devotion, but also with our eyes wide open so we fully understand the challenges and risks ahead. For example:

1. **Accelerating discovery**. Many actors in the open science space (including many in OSI) are fond of promising that open science will improve science discovery and impact, but we need to be more modest about these claims until they are proven. The advocates of this position believe that these benefits will happen and that we should work to create a world where they can happen. But for a university provost charged with managing scarce resources and ensuring that research dollars produce the maximum benefits, promising the moon might cast open science in a negative light. Discovery might indeed accelerate as certain open science reforms are adopted, such as improved access to data sets (allowing for such possibilities as new analyses, data standards, or integration with other datasets), more rapid and widespread sharing, and solutions that allow for more affordable access by more scientists around the world (allowing for more input, feedback, teamwork, and knowledge dissemination). The current frenetic pace of COVID-19 research is an excellent illustration of what more open science might be able to accomplish. But the lessons we draw from research in the time of COVID need to be evidence-based and carefully interpreted. We can't conclude that because COVID data sharing is resulting in fast progress toward a vaccine, that therefore every tenet of open science for every field is an unmitigated good. That's not what we're learning; even in this limited example, we would be ignoring the fact that the pace and urgency of COVID research is also allowing a lot of bad research to get published and publicized. Cautiously interpreted, though, this time in history is demonstrating how the research publishing process might be sped up (given enough resources) and how closer collaboration has the potential to accelerate discovery. We should learn what we can from these developments, share our facts with researchers, and continue building our evidence base for open science brick by brick.
2. **Impact matters**. Of all the incentives in the open science system, "impact" may be the most important to align, and also the hardest. Improving the impact of their work is a top priority in survey after survey of researchers (see Taylor and Francis 2014, for example). Making research more accessible through open access seems to be an easy way to improve readership, and

therefore impact. But while it is true that free-to-read journal articles can be downloaded more frequently than paywalled articles, it is also true that articles published in some types of open journals have a lower citation rate on average than for other types of open and closed journals (Science-Metrix 2018, Piwowar 2018).[5] Open in all its diversity (hybrid, bronze, green, etc.) has tremendous potential to improve access and readership. Let's support them all, and let the marketplace sort out what's working for whom (and let's also try to figure out why this is the case and gather together solid lessons of experience). Also, researchers want their work to receive credit for their work, which currently is assigned through publication in journals of repute in their fields. In many fields a journal's reputation is synonymous with its impact factor, and most of the highest "impact" journals are subscription journals.[6] Although alternatives, such as the TOP factor (see cos.io/top), have been suggested they are yet to gain wide adoption. It will be important to support and publicize such initiatives if we are to encourage researchers to make publishing decisions that assess a wider range of considerations, than simply the perceived reputation of a particular journal. Of course, making this transition is more challenging when systems of evaluation continue to prize journal reputation.

In summary, there are a wide variety of incentives for open science. Some of these incentives are a higher priority than others, some overlap with the incentives of "traditional" science, and some do not. We need to align incentives where we can, but we also need to recognize that just as open means different things to different people, so too the promise of open will undoubtedly unfold differently for different audiences—different fields of study, different institutions, researchers at different stages of their careers, and so on. The first step in our journey should be to understand exactly what we're trying to accomplish—specifically what goals, in what areas, for what reasons, what realistic outcomes we expect and why.[7] Only then should we begin discussing and aligning incentives to meet these goals.

Until then, a blanket "incentive" system for open science—where we are trying to encourage all researchers from all regions to embrace an all-encompassing vision of open science and adopt one-size-fits-all solutions—will continue to fall short of its ambitions, will risk discouraging open science advocates, and may even delay opportunities to cultivate real and effective reforms from the bottom up. Researchers and university officials will be more impressed with a detailed, realistic assessment of open science than with open science hyperbole. By getting a realistic handle on what open science can achieve and where current open efforts are falling short, we can work to create rapidly achievable goals and open roadmaps, and align incentives so researchers will choose open science because doing so is easy, clear, makes sense to them, and serves the best interest of their research and careers.

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5. The OA citation advantage is the most visible attempt so far to quantify open impact, but studies trying to measure even this one statistic have reached different conclusions to-date. Archambault's most recent study (Science-Metrix 2018) acknowledges that we haven't really looked carefully at the full spectrum of open products yet, just "gratis" (which crosses several categories of open). What we need to know is much more granular: what kinds of green open are the most effective (for instance, the green in institutional repositories, or on preprint servers, or where?), how well are different types of open (gold, bronze, etc.) received by different researchers? In other words, exactly what kind of open is needed to improve visibility and reuse? What kind of open works best and why (what factors are most important—readability, findability, reusability, all of these, or none of the above)? What measures other than citation might we use to triangulate on actual impact (since citations can be influenced by press coverage, topic salience, etc.). What correlates can we note between open and research uptake, R&D investment, and more? Holmberg (2020) discusses what impacts the altmetrics ecosystem might be having on citations and concludes that there is an open access advantage in some fields, and an open access disadvantage in others.
6. Subscription journals tend to have a higher impact factor than open journals for two primary (and related) reasons: because the majority of the subscription journals have been around for decades and because the publishers that publish them have been around for decades, or even over a century at this point, especially where learned societies are concerned. As a result of that longevity, both the journals and the publishers have had all that time to build a strong reputation, where the vast majority of open journals are less than 20 years old. Admittedly, there is still a subset of the research community that simply doesn't trust that these new-fangled open journals are as high a quality as traditional journals, even when the empirical evidence may show otherwise.
7. The INORMS Research Evaluation Working Group's SCOPE model is a useful here. SCOPE stands for (1) Start with what you value; (2) Consider context; (3) Options for evaluating; (4) Probe for problems; (5) Evaluate your evaluation. See Himanen and Gadd 2019 for more details.

WHAT ARE THE FINANCIAL CONSIDERATIONS FOR OPEN SCIENCE?

Accurately evaluating the costs of open science depends heavily on our definition of open. Are we evaluating the costs of open access as measured by a global flip to article publishing charges (APCs) versus subscription publishing? Or are we evaluating the costs to libraries of entering transformative agreements with publishers, the costs to publishers and funders of complying with Plan S requirements, the costs to research institutions of maintaining institutional repositories, or the disproportionately high costs of author publishing charges for authors from lower income countries (Suber 2020)? Or are we talking about the costs of developing and maintaining new open science infrastructure tools, or a new open science oversight agency?

Four general lessons are applicable to the question of costs:

1. **Open isn't free**. Open comes at a price, and all indications so far—at least when it comes to publishing open science research—are that this price is not going to be less than what we are currently paying. Therefore, cost savings shouldn't be promoted as an overall benefit of open. Cost shifting is a more accurate description of what we're seeing so far. A recent Wellcome Trust analysis found that average APCs have been rising 7-11% annually—about double to triple the inflation rate (Wellcome 2018; whether these trends will continue is debatable, of course). Will "gold" end up being more expensive than subscriptions over time? This issue needs more monitoring and study (Jubb et al. 2018). Even the cost savings of gold over hybrid is questionable. A recent Delta Think study showed that gold APCs are set to overtake hybrid APCs by around 2020 (Pollock and Michael, 2018a).

2. **Quality is king**. Researchers do not compare the best publishing prices (Mudditt 2018, Tenopir et al. 2017, Feng 2013) for open journals. Rather, their incentive is to publish in high status journals, many of which carry higher costs. Part of this behavior is being driven by the fact that in richer countries, researchers can tap institutional and funder sources to pay for costs, whereas in less wealthy countries, this burden can often fall primarily on researchers themselves (Suber 2020). If we're designing new open science systems that rely on research money, we need to make sure our revenue calculations are just and realistic.

3. **Paywalls v. Playwalls**. We must be careful that access paywalls do not get replaced by "play-walls" (Green 2019). Evidence today in scholarly publishing is that even very modest author publishing charges, in the range of a few hundred dollars, may be unaffordable for many authors in the global south (Scaria and Shreyashi 2018; INASP 2018; Minai 2018). This unaffordability may end up amplifying the already existing north-south gap in access to research caused by high subscription prices, as well as the Matthew Effect in science, wherein higher-status scientists are able to parlay their existing status into further cumulative advantages. Siler, et al. 2018 note that this "rich get richer" effect also applies to widening the divide between research and researchers from well-funded and less-funded institutions.

4. **Equal cost sharing**. Along these same lines, we don't want to slide toward a situation where researchers from less wealthy regions are essentially subsidizing EU and US science since the charges they pay to support open science systems—if equally distributed—will represent a much higher percentage of their research and publishing budgets than for their northern/western counterparts (Ellers 2017).

Different researchers around the world have markedly different abilities to financially support the open science system. We cannot create global solutions that work financially for researchers from only wealthy EU or US research institutions. Our policy solutions need to be globally workable and sustainable.

POLICY RECOMMENDATIONS

OSI advises that UNESCO follow the open science roadmap recommendations described in this paper, and that this path culminate in either the outright adoption of OSI's Plan A as UN policy; the use of Plan A as a blueprint for eventual United Nations policy; or the use of these roadmap recommendations and/or Plan A as the foundation for a similar United Nations policy that has the benefit of broader global input.

Released in early 2020, OSI's Plan A encapsulates recommendations that have emerged from OSI's five-year-long examination of the scholarly communication landscape. Over that period, high-level experts among OSI's participants have shared, analyzed, promoted, critiqued and debated a wide array of perspectives via conferences, meetings, reports, and email correspondence.

Based on its five-years of analysis, Plan A prescribes that moving forward the international community must:

- **DISCOVER** critical missing pieces of the open scholarship puzzle so we can design our open reforms more effectively;
- **DESIGN**, build and deploy an array of much needed open infrastructure tools to help accelerate the spread and adoption of open scholarship practices;
- **WORK TOGETHER** on finding common ground perspective solutions that address key issues and concerns (see OSI's Common Ground policy paper for more detail); and
- **REDOUBLE OUR COLLECTIVE EFFORTS** to educate and listen to the research community about open solutions, and in doing so design solutions that better meet the needs of research.

OSI advises that UNESCO follow the open science roadmap recommendations described in this paper, and that this path culminate in either the outright adoption of OSI's Plan A as UN policy; the use of Plan A as a blueprint for eventual United Nations policy; or the use of these roadmap recommendations and/or Plan A as the foundation for a similar United Nations policy that has the benefit of broader global input.

In pursuing these actions, the international community should:

- Work and contribute together (everyone, including publishers);
- Work on all pieces of the puzzle so we can clear a path for open to succeed;
- Discover missing pieces of information to ensure our efforts are evidence-based;
- Embrace diversity. No one group has a perfect understanding of the needs and challenges in this space, and different groups have different needs and challenges.
- Develop big picture agreement on the goals ahead and common ground approaches to meet these goals; and
- Help build UNESCO's global open roadmap.

Plan A also recommends that the community's work in this space be:

- Common-goal oriented;
- Accountable;
- Equitable;
- Sustainable;
- Transparent;
- Understandable; and
- Responsive to the research community.

Approaches to open access must be developed carefully and in close collaboration with the research community. By doing so, we will ensure that research is protected during this transition and that it is well-served by the outcome of our efforts.

ACTION STEPS

Plan A proposes that beginning in mid-2020 and continuing for a period of five years, the global scholarly communication community collaborate on four main categories of action: (1) Studies, (2) Infrastructure development, (3) Common ground work, and (4) Education/outreach:

1. **Studies**: The international community requires a better understanding of the scholarly communication landscape. Our community's lack of understanding about key issues has, for the past 20-plus years, made it difficult to create effective reforms. OSI proposes working collaboratively to support and conduct studies that will help us find needed answers to questions such as (but not limited to):

    a. What are the exact dimensions and implications of so-called "predatory publishing" (how fast is it growing, how is it changing, how is it impacting research, and more)?

    b. How can we reduce misuse of the impact factor (is inventing a different impact factor the answer, and if so, what does this look like in practice)?

    c. Can embargoes be reduced or eliminated, and if so, how? (we need to generate actual data on this)

    d. What are the demonstrable impacts on research and society of openness (the open access citation advantage is just one such measure; how else are impacts being measured and what kind of quantitative comparisons can we make)?

    e. What kinds of open are most effective in what fields and for what purposes (are CC-BY-licensed studies and studies with data used everywhere as intended, how does this use compare with other kinds of study formats, and more)?

    f. What global approaches will succeed at shifting the culture of communication in academia toward more openness? OSI has identified 12 such studies that should be considered, and that are foundational to designing approaches to open research that are evidence-based.

2. **Infrastructure development**: The global scholarly communication community needs new infrastructure items—products, services, tools, websites, and other resources—that will help encourage, achieve, sustain and monitor reforms in this space. Our community should develop these items together, and reasonably quickly, so reforms can be more easily adopted and the scholarly

communication landscape can be more quickly and easily improved and maintained. OSI has identified seven infrastructure items for potential development, including: an all-scholarship repository (possibly built using CERN's Invenio); an APC discount/subsidy database; an open index of all scholarly publications; an APC price comparison tool; a customer review website for scholarly publishers; repository upgrades; publisher standards; and an annual "state of open" survey.

3. **Common-ground work:** There is vast common ground in the scholarly communication community. Most of the groups in this space from across the regional and stakeholder spectrum recognize and respond to many of the same challenges and issues. This commonality exists both within and between stakeholder groups. As a broad, global community, though, we have never taken the time to work through our differing perspectives and identify specific ways we can work on these challenges and issues together at scale (there have been many instances of limited sharing and collaboration, including OSI itself, but nothing approaching a global movement to work together). OSI conference delegates have done this kind of work—their ideas and perspectives are summarized in OSI's "Common Ground" policy paper. These ideas and perspectives might be helpful seeds of a broader, global conversation. What are our common goals for the future of open? Can we create a common framework for understanding how open publishing practices overlap with open data, open education, and open code? Can we learn from the open movement writ large to inform and guide what we're trying to accomplish in academia and where we want this work to ultimately lead us? Are there specific common ground solutions identified by OSI that we can move forward with right away? Building on the common ground we have in this community, we have a better chance of developing the right detailed solutions together, in the right order, and for the right reasons, and these solutions will have a better chance of being adopted, sustained, and bearing fruit.

4. **Education/outreach**: The scholarly communication community has overestimated the degree to which researchers are informed and convinced about open scholarship. There is, in fact, a great deal of misinformation and lack of information in this space which is hindering progress. In order to make more and faster progress on open reforms, our community needs to be better informed with regard to "open" definitions, opportunities, impacts, processes, options, and so on (note that some of this information will come by way of new studies that more clearly identify the impacts of open). Our community also needs a better system in place for listening to stakeholder feedback, and for creating and adjusting to solutions accordingly. Of particular focus on the listening side, we need a clearer and more detailed understanding of exactly what researchers want and need, what they will use, and what we hope to accomplish with reforms so we can make sure to ask the right questions, collect the right data, and pursue the right solutions. OSI has identified three key education/outreach programs to pursue, including international meetings where all stakeholders can discuss the outlines of a new global roadmap for open scholarship (both independently and as part of UNESCO's global roadmap effort), combating predatory publishing through improved awareness and standards, and working together to better understand the needs, goals and concerns of researchers in different disciplines, fields, labs, regions and institutions, and career stages.

PARALLEL ACTIONS

Plan A also proposes that, in parallel to these four main points of action, the international community must improve the relevance of open to researchers and society by:

- Opening and centralizing all climate change-related research (to the extent it can be without compromising private health information);

- Creating zero-embargo compassionate use access portals for patient families and for researchers combating health crises (whether through a new program or by strengthening and expanding the existing Emergency Access Initiative);
- Creating a more robust Research-4-Life program for lower-resourced regions and institutions; and
- Considering how to modify current openness programs to improve researcher use and engagement.

DIVERSITY AND INCLUSION

OSI believes that a one-size-fits-all approach is unlikely to succeed. An open research future will be an inclusive movement that is informed and empowered by vast diversity. This will lead science and society to new opportunities, globally and across all disciplines.

This broad vision includes:

- Fostering open science literacy through the development and promotion of open science curricula within educational programs, particularly ethics and AI (e.g., Foster Open Science, OS MOOC)
- Growing open science support through the establishment of an assortment of open science roles throughout institutions (e.g., increased Dutch national support for open science—see Wezenbeek 2017)
- Unpacking research papers and providing discovery and credit mechanisms for research objects/components including software, data, workflows, etc. (e.g., FAIR, SCHOLIX)
- Creating common assessment mechanisms to track open science progress (e.g., OA Monitor, OA Switchboard)
- Expanding support for broader impact in research funding to facilitate greater connections between research and the public (e.g., communicating science to public, citizen science)

OSI's overall recommendation is to embrace the diversity of activity in the open space while making it possible for new actors to enter. This ethos of diversity and inclusion will be the foundation upon which a truly robust open future will rest.

- Broadening computational support for data processing and analysis-intensive research (e.g., EOSC, Binder)
- Opening peer review mechanisms, increasing transparency, improving quality and providing new incentives/credits for reviewers, plus more support for preprint services (e.g., F1000, PLoS, arXiv)
- Learning from standards and approaches commonly used within the broader information technology community (e.g., Schema.org)
- Tending to open science culture via early career communities, and offering advancement opportunities (e.g., RDA early career, Carpentries training)
- Continuing to think through national plans for open science (e.g., the US National Academies' Open Science by Design, the European Commission on Open Science)

OSI's overall recommendation is to embrace the diversity of activity in the open space while making it possible for new actors to enter. This ethos of diversity and inclusion will be the foundation upon which a truly robust open future will rest.

SHORTCOMINGS OF THIS INQUIRY

It is important to recognize where this effort may fall short of enabling actionable policy decisions. Such shortcomings include:

1. **"Open Science" isn't enough**. The effort to reform the future of open science cannot be carried out in a vacuum. Inevitably, the reforms made to open science will result in systems changes to the humanities and social sciences, as well. It will be necessary for us to think more broadly in terms of "open scholarship," not solely "open science."

2. **Open science isn't for everyone**. Science isn't homogeneous. Different research fields have different open science needs, institutions have different abilities to comply with solutions like APC publishing and sophisticated data repositories, and so on. Even the origins of science research are more diverse than we may realize: most research is conducted outside of universities, even though university-based researchers are responsible for most of the research that gets published in science journals. So, how do we create a future for open science that lifts all science and scientists everywhere (and what happens to science if we create solutions that don't impact the entire system)?

3. **Open science isn't a given**. Generally, goals like "improving the value of science to society" are common refrains in open science, but these goals are most often posited uncritically, as though more open science will necessarily happen by fiat, or will necessarily lead to better outcomes for both science and society. As a global community of stakeholders who are all interested in ensuring the best possible outcomes for the future of open science, we owe it to ourselves and to science and society to ensure that our efforts don't fall short, or create unintended consequences.

4. **A common ground approach is needed** to develop workable, global solutions like UNESCO is hoping to develop. The case for common ground is detailed in OSI's Common Ground paper. However, searching for common ground has never been tried before in this space in a broad, high-level, international sense. What are our common goals and interests? What are the pillars of our foundation for the future of open science? Might it be possible to unite to some degree the various threads of open code, open source, open access, open educational resources, open society, and other open information movements, and if so, to what end? We have discussed here that these movements have a rich and varied past and often have different foundations, objectives, and audiences, but would it help unite and accelerate the open movement if we could identify areas of common ground to build on?

5. **We don't know what we don't know**. There is still a lot of unknown in this debate, and a lot of uncertainty. How we define open science determines the elements of open science. The elements of open science determine the actors, incentives, and so on. The information we need to ground this policy framework isn't at all clear and objective. Our first steps need to involve gathering more information and convening stakeholders so we can better understand our common ground perspectives and discuss together what needs to be done next.

6. **No one is in charge.** There is no sense at the moment that any single organization's recommendations are, by themselves, going to influence the trajectory of open science. Perhaps UNESCO's recommendations will include some provisions for how its open science roadmap should be globally implemented. Until then, global policy fragmentation continues, with the US, EU, China and India all considering or adopting new publishing approaches. What would a plausible unified effort look like? In his final paper before his death, open advocate Jon Tennant speculated that a new international body is needed (Tennant et al. 2020b). This body would need to be widely supported and well funded by all key stakeholder groups, and could help create policies, maintain infrastructure, monitor access issues, and otherwise help facilitate more common action on challenges.

Inevitably, the reforms made to open science will result in systems changes to the humanities and social sciences as well. It will be necessary for us to think more broadly in terms of "open scholarship," not solely "open science."

THE POSSIBLE UNINTENDED CONSEQUENCES OF 'OPEN SCIENCE'

OSI's Common Ground paper describes the possible unintended consequences of the world's current trajectory on open science reform.

These consequences include:

- **Fractured solution spaces** as different regions adopt different solutions—for instance, Plan S for the EU; China's "Excellence" plan (Tao 2020); and the US's possible forthcoming public access revisions (OSTP 2020)
- **Wider gaps** between haves and have-nots in research communication if APCs are relied on too heavily to pay for open access (Hampson 2019)
- **Systemic issues** within scholarly communication becoming exacerbated. These include impact factors, embargoes, peer review and the culture of communication in academia.
- The **diminished role** of gatekeepers in scholarly publishing, which leads to sub-standard publication practices and predatory publishing.
- An outright **rejection of open** by researchers. Different researchers have different needs, varying by field, institution size, career stage, region, and more. By trying to incentive the adoption of one-size-fits-all solutions that work for just one category of researcher, we may inadvertently be incentivizing a rejection of open research instead as an unwanted and unneeded intrusion on research.
- Flowing from all of the above, **damage to science and to the future of open science** as we work for reform based not on what's in the best interest of research, but on the approach that sees open science is an ideological battle to be waged and won.

Richard Poynder's 2019 paper (Poynder 2019) summarizes many of these concerns and also articulates additional ones. These include:

- Naiveté about the true costs of open access solutions, which may not be less expensive than today's models;
- The consolidation of power and influence among legacy actors in the publishing world;
- A growing disconnect between what open access advocate desire and what researchers want;
- The stubbornness of relying on impact factors as a determinant for where to publish, and the influence impact factors have in guiding publishing decisions;
- Enthusiasm for preprints without considering the full consequences for quality, peer review, and the overall publishing process;
- "Playwalls" replacing "paywalls," wherein less affluent regions or institutions are excluded from publishing altogether;
- The intensity of global nationalism and rivalries among nation-states that are affecting Internet access and Internet freedom;
- Privacy trade-offs and the hidden costs of "surveillance capitalism."

Poynder's take-away is that we must not snatch defeat from the jaws of victory. Open has made tremendous progress over the past 20 years; however, as Rick Anderson notes in his summary of Poynder's article (Anderson 2019), "Both the constellation of OA publishing models and the global social movement that seeks to promote them are complex and multifaceted, and the strengths and weaknesses of one are not necessarily commensurable with those of the other."

For UNESCO, this means the best course of action to avoid unintended consequences is to take a flexible approach to the challenges ahead, staying focused on what's best for research and researchers, and setting big goals but moving toward these goals with due diligence. This recommendation is in line with OSI's other recommendations in this paper. The future of open science needs to be developed by all stakeholder groups from all parts of the world working together on a broad framework that embraces the diversity in this space and builds on our common ground.

THANK YOU

Thank you again for this opportunity to contribute to your policy deliberation process. We would be pleased to provide additional feedback as requested.

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ANNEX 1:

OSI's COMMON GROUND OBSERVATIONS

The following table lists a few of the major issues in scholarly communication and our community's interests, concerns and solutions regarding these issues. Just because we often disagree on the best solutions doesn't mean we disagree about the issues. Broad statements of interest and broadly stated options for addressing these issues are where we start. These statements can be vague, but they are essential starting points for discussions. See OSI's Common Ground paper for a full discussion (this table is from the paper; see Hampson 2020).

Problem/issue	General approaches we all agree on	Disagreement about specific solutions	Common ground interests and concerns that should govern our development of solutions
Peer review is struggling	Experiment with different peer review systems	What kind of peer review is best	Preserve the value of peer review
Impact factors have a corrosive effect on publishing	Experiment with other ways to measure impact	Different stakeholders have different needs for impact measures	Impact factors should not be the tail that wags the dog and should not distort publishing choices in academia
Open access isn't growing fast enough	Consider ways to accelerate open adoption rates	Are different kinds of open equally valid and valuable? Is open actually growing slowly?	Let's keep working for more open of all kinds (70% of info out there is still closed). We can improve open outcomes over time.
Journal subscription costs are increasingly unaffordable	Experiment with different subscription formats, disaggregating publisher services, non-subscription options like APCs, etc.	Should subscriptions and hybrids should be eliminated altogether?	Cost and access are the underlying concerns here, not the particular format. If subscriptions were more affordable and accessible they wouldn't be targeted for elimiation. Can we do this?
Embargoes may be too long	Study what embargo period is just right	Are all embargoes bad? What if some are necessary for indusstry health?	We're operating in an information vacuum. Study this before deciding.
Does increased digitization put preservation of science information at risk?	Invest in systems such as LOCKSS to ensure the digital record is preserved	No argument	No argument. Preservation is essential, and of particular concern for non-established journals
Fraud and replicability issues in science and publishing	Improve systems and oversight	No argument	No argument
Information overload	Improve information literacy and build better filters	No argument	No argument
Information underload	Create better access systems	Yes, but how? Open access is the most obvious system.	Better access is the common denominator—how we get there from here can involve multiple tools.
The culture of communication inside academia is broken	Identify unmet author needs, and gaps in evidence and knowledge, develop disciplinary approaches, and use pilots to determine solutions.	Just blow it up and start over?	The current system serves a purpose and is strongly resistant to wholesale change. Change will take time, and will need to create outcomes that are better than before.
Institutional repositories are not living up to their promise	Increase focus on these resources and improve interoperability through better systems and "domes" like CHORUS and OpenAire.	Or just move to a preprint world.	Pre-prints have tons of potential and tons of challenges. So do more futuristic repositories. Let's keep developing all our options and see where it takes us.

The boxes on the following pages (and to the right) contain some of the observations from OSI that represent what common ground perspectives might look like in the open research debate and what researchers and policymakers might want to keep in mind as future reforms are debated.

These are the same common ground recommendations from OSI's work and conferences that have been interspersed throughut the first part of this paper, with the addition of a few other recommendations.

The common denominator is this: common ground isn't a complex, solution-riddled landscape but a simple framework where the scholarly communication community sees common interests, criteria, purpose and goals, and identifies ways to work together across divides on solutions that help every member of the community succeed through better understanding, better support, and recognition of a multitude of different efforts aimed at advancing the community's needs.

One important lesson we have drawn from this work is that don't need to agree on every solution right away or dwell on the years of divisions in this space in order to make progress. Focusing instead on the positives and the common elements in this space—the tremendous energy and enthusiasm for reform, the number of people and organizations working on reform, our common commitment to solving pressing issues, and our common vision for the future—it is clear that this community has the capacity to build for the future on common ground.

For a fuller discussion of common ground in our quest for open science, please see OSI's Common Ground paper (Hampson 2020).

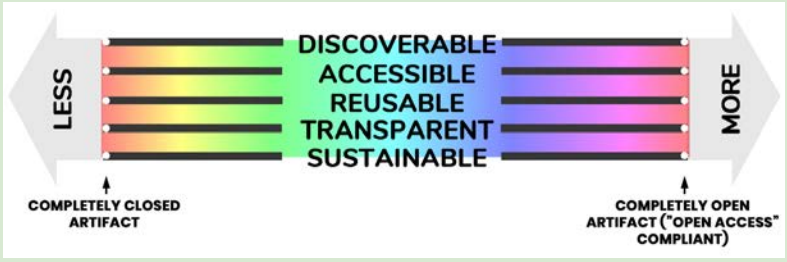
Stakeholder groups agree amongst themselves that there are issues they can focus on to make improvements to the open

2. **Journal editors**: Improve global journal standards through mentoring and networking, reducing the influence of impact factors, and improving indexing
3. **Libraries**: Support, engage and/or collaborate on building a framework for action, connecting resources, and improving the global capacity for open
4. **Open knowledge groups**: Help reduce the jargon, deliver more content to communities who need it, and establish financial sustainability for a diverse open environment
5. **Commercial publishers**: Improve the ability of coordinat-ing groups (like OSI) to engage in this issue and cultivate common ground perspectives and solutions, and be will-ing to adapt in a way that is responsive to and respectful of the community's input
6. **Research universities**: Think critically and creatively about developing programs and platforms that explore open in ways that meet the needs of researchers. Support inno-vation and experimentation along these lines from many different stakeholders
7. **Scholarly communication experts**: Get more input from researchers, support more author choice, help establish better standards, and encourage "exchange" programs where leaders can get out of their silos
8. **Scholarly societies**: Educate constituencies on the benefits of open, explore consolidation and other ways to increase efficiencies, and explore the redistribution of funds to better support open.

* This list of recommendations is from OSI2017 participants. As with the issues list, there are other lists like this, and other recommendations. See the OSI2017 report for more detail.

BOX 2: OSI'S COMMON GROUND PERSPECTIVES ON THE OPEN CHALLENGE

It was stated in the body of this paper that most of the participants in OSI have concluded that four main beliefs define the common ground in this space:(1) Research and society will benefit from open done right; (2) Successful solutions will require broad collaboration; (3) Connected issues need to be addressed, and (4) Open isn't a single outcome, but a spectrum. These four beliefs are a summation of the nine common beliefs that OSI2017 participants identified (see the OSI2017 report for more detail):



1. **Open isn't binary**. The terms "open" or "open access" (OA) are used in a wide variety of ways. For instance, some open advocates see open access as an optimal, singular state meeting specific conditions. Others (including many researchers in this field) will call any kind of open information "open access," as long as it is free to read. This flexibility is a natural outcome of how open has evolved in the scholarly communication community. Therefore, we have concluded that instead of being a rigid, binary concept, open actually exists along a spectrum of outcomes, with wide variation according to discoverability, accessibility, reusability, transparency, and sustainability (DARTS).* Keeping the DARTS spectrum in mind can help the community recognize that open and open access are highly variable terms—that when two groups advocate for more open, they may actually be supporting entirely different outcomes.

2. **Open isn't free**. The focus of open cannot be only about cost-savings. Open is going to cost money—the jury is still out on exactly how much.

3. **Open isn't easy**. Achieving open outcomes can be complicated. The easy solution isn't necessarily going to be the correct solution.

4. **Publishing is critical**. Without publishing, there is no modern, reliable scientific record. This isn't to say that publishing as-is is infallible or indispensable, just that we need to make changes with care and respect for the vital role that publishing plays in research.

5. **We're more alike than unalike**. There are wide differences of opinion in this community but also significant overlap in our perspectives.

6. **Convergent needs are everywhere**. Convergent needs and aspirations are everywhere in this community. This can be difficult to recognize when we spend most our time arguing about what color of open access is best. From a 10,000 foot level, however, this convergence is obvious.

7. **We need more information**. There are significant gaps in our community's understanding of many key issues in scholarly communication. More study is needed.

8. **Accountability**. We all have a stake in the outcome.

9. **Trust**. This conversation needs trust to move forward. There is a lot of mistrust in the scholarly communication system which has been so polarized for so long.

* DISCOVERABLE: Can this information be found online? Is it indexed by search engines and databases, and hosted on servers open to the public? Does it contain adequate identifiers (such as DOIs)? ACCESSIBLE: Once discovered, can this information be read by anyone free of charge? Is it available in a timely, complete, and easy-to-access manner (for instance, is it downloadable or machine-readable, with a dataset included)? REUSABLE: Can this information be modified? Disseminated? What conditions (both legal and technical) prevent it from being repurposed or shared at will? TRANSPARENT: What do we know about the provenance of this information? Is it peer reviewed? Do we know the funding source (are conflicts of interested identified)? What do we know about the study design and analysis? SUSTAINABLE: Is the open solution for this information artifact sustainable? This may be hard to know—the sustainability of larger, more established solutions may evoke more confidence than new, small, or one-off solutions.

BOX 3: IMPROVING THE CONTRIBUTION OF RESEARCHERS

As noted in box 1 (item 7), more research in this field is critical to developing a better understanding of the challenges we face (see annex Plan A for some of the needed studies OSI has identified). Improving the quality of research is also important. Too much of it is subpar, using bad data sets (like Beall's list), making unwarranted extrapolations (e.g., drawing conclusion about all journals based on a sample from Scopus), or inadequately defining terms (e.g., "open" means different things to different people). Therefore, in order to help improve our knowledge of this field, researchers should endeavor to make their data more usable and comparable. Some of the recommended improvements include:

1. **Avoid Beall's list**. Do not use this list when conducting research into predatory publishing. This list is not now nor was it ever transparent. In addition, what passes for Beall's list nowadays is an anonymous update of an old, flawed list. Use Cabell's list instead. It isn't free, but it is transparent. (On a related note, "deceptive" publishing is a more accurate name than "predatory"; see Anderson 2019).

2. **Define open**. Carefully define what you mean by "open" and "open access" in your research work. These two terms have a wide variety of definitions and uses—there is no consensus definition and/or use that holds up in all parts of the scholarly communication community (see Plutchak 2018 for more detail).

3. **Follow best research practices**. Doing so in this field can be challenging for several reasons—bias, missing information, a rapidly-changing information landscape, and more.

    a. **Try to find the most definitive figures** when talking about how much open exists. Work by Eric Archambault, and by Heather Piwowar and Jason Priem, is among the best to-date. See Archambault 2018 and Piwowar 2019 for more information.

    b. **Be careful not to generalize** from one field to another with regard to the impact of open, the suitability of open practices, and more. Similarly, recognize that different fields and institutions have different characteristics, norms, missions, needs, and so on. One-size-fits-all measures and analyses are too broad—the devil is in the details.

    c. **Beware of bias**. Quite a few analyses in this field suffer from confirmation bias and read more like position papers than research. Many analyses also bias the reader by using inflammatory language, or by twisting data. This happens on both/all "sides" of the open debate—reader beware.

    d. **Be honest about uncertainty**—there's a lot of it in this field.

    e. **And of course, be scrupulous about other research practices**. Some of the more relevant practices include making sure your measures don't discriminate against organizations by size, disciplinary mix, language, wealth, age and geography (e.g., many good, non-Western journals are not indexed in Scopus, open practices vary by field and career stage, and so on); making sure that collection and analysis methods pass tests of scientific rigor; and making sure that indicators have a clear relationship with and are sensitive to what's being measured.

4. **Be wary of data from predatory journals**. There are a many more journals today than just 20 years ago, but obviously, not all are of equally high quality. While some of these journals may contain acceptable research, don't conclude that just because a journal claims to be peer reviewed, indexed, or have a high impact factor that it must be quality—there are many different types of indexes (many which serve no gatekeeping function), different interpretations of peer review (some akin to just copyediting), and several bogus impact factor measures that predatory publishers use.

5. **Be careful when comparing samples between different indexes**. Different indexes are different. Scopus has a different product concentration than WoS, which is different than DOAJ, and so on. So, for instance, don't conclude that since x% of journals in Scopus are open, that therefore x% of all journals are open.

The European Commission's February 2019 report entitled "Future of Scholarly Publishing and Scholarly Communication," lists several other recommendations for how and where the research community can work together (see EC 2019). Two recommendations in this report relevant to improving research quality are to (1) make more research contributions open, discoverable, and reusable according to community standards (including the FAIR principles); and (2) "Develop, use, and support interoperable tools (including open source software wherever possible) and services not only to facilitate access and reuse of scholarly outputs, but also to facilitate innovative interventions of new entrants."

BOX 4: CENTRAL ISSUES WE ALL RECOGNIZE

There is significant agreement amongst all stakeholders on which scholarly communication issues need to be addressed and why.*

1. **Culture of communication in academia**: We need to clarify messages about open and break down barriers and simplify pathways to more open adoption. We also need to engage universities and scholarly societies in a conversation to encourage new advancement pathways that include more use of open, and that can help untangle publish or perish attitudes and metrics like the impact factor from promotion and tenure considerations.

2. **Funding**: There is no single model of open that works for all stakeholders and institutions everywhere. As a community, we need to stop aligning our funding primarily behind one-size-fits-all solutions, and instead fund a wider variety of approaches for a variety of actors and audiences.

3. **Studies**: There are many gaps in our understanding of scholarly communication, from predatory publishing to the global flip to embargoes, citation advantages, the economic benefits of open, and more. We should work as a community to fund and conduct studies to fill in these information gaps.

4. **HSS & Science**: The fact there are no one-size-fits-all solutions is nowhere more apparent than comparing the different needs of HSS disciplines (like history) with disciplines in the natural sciences. This said, while we can develop better tailored solutions (or disciplines can develop their own), we should also continue to promote areas of mutual interest and benefit.

5. **Impact factors**: Impact factors are loved by some stakeholders, despised by others. They are a net positive for some, and a terrible scourge for others. We need to reform the use of impact factors—this much is clear. Exactly how is another matter.

6. **Open IP**: The global community should work with WIPO, NISO, and other relevant organizations to establish new global standards for open IP and create IP literacy materials for the research community.

7. **Peer review**: We need to work as a community to develop new global standards for journals. We also need to study the effectiveness of different models and support the community as it experiments.

8. **Institutional repositories**: Repositories are a crucial tool in the custody chain of research preservation. We need to better understand the challenges ahead and ensure we're asking the right questions and pursuing the best solutions.

9. **Rogue solutions**: Our community must take a stand against Sci-Hub types of solutions that violate copyright laws and are off the open spectrum, while also supporting new and entrepreneurial approaches to open.

10. **Standards**: There are many issues in this space that would benefit from a standards-based approach—from what we consider to be "open" (here again, many in OSI encourage recognition of the entire open spectrum) to what publishers should do, what best practices researchers should follow (beyond DORA), and much more.

11. **Underserved**: There is much work we can do as a community to encourage more openness in universities and public sector institutions, better address the wide variety of research-related needs and concerns that emanate from the vast diversity and asymmetries of the scholarly communication environment (such as indexing, standards, and promotion and tenure practices), and narrowing the affordability gap.

*This list from OSI2017 conference participants and is just a starting point for discussion—there are other lists, and other issues in common. See the OSI2017 report for more detail.

BOX 6: COLLABORATIVE OPEN INFRASTRUCTURE PROJECTS PROPOSED BY OSI*

APC DISCOUNT/SUBSIDY DATABASE: There are no databases of article processing charges (APCs) or subscription discounts or subsidies. Researchers looking for charges, discounts or subsidies need to search for these one at a time. Research4Life leaders have noted that building such resources would be immensely helpful to authors, particularly those from the global south where discounts and subsidies are most needed, and also where price comparisons are more needed.

OPEN IMPACT FACTOR + OPEN INDEXES: One of the consequences of our uneven progress toward open is the unavailability of legitimate impact factors for all journals (because not all journals are indexed), Because the alternatives (such as "global impact factor" or "universal impact factor") aren't legitimate, there is a need in the marketplace for new solutions that are legitimate. Among the possible solutions to this problem are: (1) Creating an open impact factor measure, (2) creating an all-inclusive open index, and (3) creating an index of indexes. All three products/services have unique audiences and all three will be developed/piloted together.

APC PRICE COMPARISON TOOL: Several recent studies have confirmed (Tenopir 2017) that scholars do not shop around for the best prices on APCs. And yet price shopping is behavior is assumed to exist and is fundamentally important to the success of a number of recent, high-profile, APC-centric reform initiatives. However, APC price shopping may not exist yet simply because there is no tool to help facilitate this (to be clear, price is a factor, but surveys have shown that authors care more about quality and impact than price; the argument here is that if it was easier to compare prices, then maybe price would factor more in decisions). Developing an APC price comparator tool might therefore be of service to the global scholarly communication community.

YELP SITE FOR SCHOLARLY PUBLISHING: The core purpose of the Yelp site for scholarly publishing will be to provide an easy-to-use, familiar-looking interface where customers (authors, editors, reviewers, funders and more) can rate scholarly publishers (not just commercial journals but university presses, scholarly society journals and more) and where publishers can provide important contact and product information—a link to their website, a summary of their products and services, links and credentialing badges that verify data such as indexing and impact factors, and much more. Customers will be able to search this database for publishers in their field, price range, region and more—like the actual Yelp site, searches can be filtered in a wide variety of ways. Customers will also be able to provide reviews regarding their experiences with publishers, which will help round out the data provided by Cabell's blacklist and other information sources.

ALL SCHOLARSHIP REPOSITORY: The All-Scholarship Repository (ASR) is the ultimate game changer in scholarly communication. Rather than continuing to rely on (and expand) our global network of institutional and national repositories, and then exert herculean and ultimately inadequate efforts to connect the meta data in these repositories (which ends up only providing a glimpse into the contents of each repository, not full access to the contents themselves—at least at the moment), ASR jumps over this step and instead creates a single warehouse for all scholarly research content. The advantages of this global preprint server concept are multifaceted: full-text searches across all articles, the potential for widescale database standardization and integration, the potential for vastly expanded cross-discipline integration, the potential to implement widescale online peer review solutions, real-time and transparent impact measurement (via downloads, views, comments and reader scores), instant open for all content, and more. ASR, in essence, solves a hundred pressing issues in scholarly communication in one fell swoop.

Other: Predatory publisher blacklist, iTunes single-article article shopping/download system, annual "state of open" survey.

***** This list is summarized from the annex section of Plan A (see this paper's annex section)

BOX 5: COLLABORATIVE STUDIES PROPOSED BY OSI*

DECEPTIVE/PREDATORY PUBLISHING: Exactly how fast is deceptive/predatory publishing growing, how much of it exists, and what are its dimension (by region, discipline and so on)? Very little definitive is known about this phenomenon, and yet it is perhaps the single most disruptive influence in publishing today (Anderson 2019; Strinzel 2019). This study will describe what we already know about predatory publishing, and will also enlist the aid of leading researchers who are part of OSI to suss out long-term data about the growth of predatory titles over time.

IMPACT FACTORS: Impact factors are one of the most destructive measures used in science today (OSI 2016a, Bosman 2013). They are also one of the most important and widely used. How can both of these statements be true? Because impact factors are the statistic we love and hate—we know they are more or less meaningless (Lozano 2012), but we also know that high impact factor work translates into promotions and grants. This study will focus on rethinking the mathematical foundation of impact factors. It will also rethink policies regarding how we use future impact factors in order to avoid perpetuating the "arms race" situation we have now where publishing in high impact factor journals is seen (incorrectly) as a proxy for quality, relevance and impact.

EMBARGOES: How necessary are embargoes? Publishers insist that a 6-12 month delay is necessary between publication and free public access in order to protect subscription revenues. Critics contend that this time could be shortened—that there are other ways to protect revenue streams that don't involve long paywalls. To-date, the only estimates of ideal embargo length have come from citation half-life studies. In order to generate more "real" data on this matter that directly answers the question of how long is too long (instead of inferring this from half-lives), we will conduct a blind study with the cooperation of publishers, reducing or eliminating embargoes for a select number of publications and monitoring this impact of this action on revenues.

OPEN NEEDS & IMPACTS: The OA citation advantage is the most visible attempt so far to quantify open impact, but studies trying to measure even this one statistic have reached different conclusions to-date. Archambault's most recent study (Science-Metrix 2018) is the most authoritative, but even this study didn't look at the full spectrum of open products, just "gratis" (which crosses several categories of open). What we need to know is much more granular: what kinds of green open are the most effective (for instance, the green in institutional repositories, or on preprint servers, or where?), how well are different types of open (gold, bronze, etc.) received by different researchers? In other words, exactly what kind of open is needed to improve visibility and reuse? What kind of open works best and why (what factors are most important—readability, findability, reusability, all of these, or none of the above)? What measures other than citation might we use to triangulate on actual impact (since citations can be influenced by press coverage, topic salience, etc.). What correlates can we note between open and research uptake, R&D investment, and more?

CONNECTEDNESS/STANDARDS/ROADMAP: How related are different concepts and applications of open (across coding, books, journals, etc.), and where can we merge these concepts, applications and even open efforts?

PUBLISHING IN RPT: Publish or perish has been the norm in academia for decades now. This dynamic is not abating; indeed, it's accelerating (Plume 2014). Around the world, we see a wide variety of influences that are causing the number of research articles to stay high, including requiring publishing for a PhD (India), awarding cash bonuses for publishing in high-impact journals (in China; Montgomery 2018), and more. There is also increasing sloppiness in the system wherein publishing in predatory journals may not always be noticed or questioned (Shamseer 2016). We need a landscape analysis of RPT practices worldwide with regard to publishing. From this analysis, we will develop a set of best practices recommendations for UNESCO and national departments of education.

Other: Peer review, global flip, publisher profit margins, global publishing standards, more

***** This list is summarized from the annex section of Plan A (see this paper's annex section)

ANNEX 2:
OSI's Plan A

March 30, 2020 version

An inclusive, achievable, sustainable approach to global scholarly communication reform

INTRODUCTION

OSI is a diverse, global group comprised of many of the world's most knowledgeable and trusted experts on open access. These experts are advising the world's most influential institutions, and as a group, OSI is advising the United Nations Educational, Scientific and Cultural Organization (UNESCO).

In service to these institutions, and to the global research community, OSI's Plan A will help advance the world toward greater open access. Plan A participants will:

- Conduct much needed studies to fill in gaps in our understanding of the open research challenge
- Create new and needed infrastructure tools and resources to help accelerate our progress toward open
- Develop and distribute open educational materials, and conduct outreach in the research community to help familiarize researchers with open concepts and resources
- Convene, survey, and communicate with all stakeholders, and work in partnership with UNESCO to help build our community's common ground, and
- Lead ambitious efforts to open more climate change research and health/medical research.
- Who is this effort for and why does it matter? The movement to "free" our information is a global phenomenon that has been transforming culture for decades now. These pressures have led to massive innovation, but also unintended consequences, like the rise of fake news and the death of newspapers. It is therefore vital that the changes we make to research communication are well considered—that we fully understand the facts behind our reform proposals, that we work on reforms as a community since there are so many different and equally valid interests and stake, and that we understand our common interests and so we can work together toward our common goals and strive for an open research future that is rich, robust, and sustainable.

Plan A is a necessary first step toward making real and lasting improvements to the future of research communication. From this strong foundation, the sky's the limit.

THE PROPOSAL

OVERVIEW

The Open Scholarship Initiative (OSI) is the world's only large-scale, high-level, multi-stakeholder effort focused on developing an inclusive, achievable, sustainable approach to global scholarly

communication reform. Over 400 top leaders in scholarly communication have participated in OSI since 2015, representing 250 institutions from 27 countries and 18 stakeholder groups.

Plan A is a synopsis of the main themes and recommendations that have emerged in OSI during this group's examination of the scholarly communication landscape. Over this period, OSI participants have shared, analyzed, promoted, criticized and debated detailed perspectives and information through conferences, summit meetings, dozens of reports, and thousands of emails. In accordance with the group's goals and conversations, Plan A sets forth that the international scholarly communication community should begin immediate and significant joint action to:

1. **DISCOVER** critical missing pieces of the open scholarship puzzle so we can design our open reforms more effectively;

2. **DESIGN**, build and deploy an array of much need open infrastructure tools to help accelerate the spread and adoption of open scholarship practices;

3. **WORK TOGETHER** on finding common ground perspectives solutions that address key issues and concerns (see OSI's "Common Ground" policy paper for more detail); and

4. **REDOUBLE OUR COLLECTIVE EFFORTS** to educate and listen to the research community about open solutions, and in doing so design solutions that better meet the needs of research.

In pursuing these actions, our community should:

1. Work and contribute together (everyone, including publishers);

2. Work on all pieces of the puzzle so we can clear a path for open to succeed;

3. Discover missing pieces of information to ensure our efforts are evidence-based;

4. Embrace diversity. No one group has a perfect understanding of the needs and challenges in this space, and different groups have different needs and challenges.

5. Develop big picture agreement on the goals ahead and common ground approaches to meet these goals; and

6. Help build UNESCO's global open roadmap (described herein).

Plan A also recommends that the community's work in this space be common-goal oriented, accountable, equitable, sustainable, transparent, understandable, and responsive to the research community. While it is important to make research more open so society can benefit more from research, our approaches to this challenge must be developed carefully and in close collaboration with the research community. By doing so, we can ensure that research is protected during this transition, and that it is well-served by the outcome of our efforts.

MAIN ITEMS

Plan A proposes that beginning in mid-2020 and continuing for a period of five years, the global scholarly communication community cooperate and collaborate on four main categories of action: studies, infrastructure development, common ground work, and education/outreach:

1. **Studies**: We need to develop a better understanding of the scholarly communication landscape. Our community's lack of understanding about key issues has, for the last 20-plus years, made it difficult to create effective reforms. To this end, we propose working collaboratively to support and conduct studies that will help us find needed answers to questions such as (but not limited

to): What are the exact dimensions and implications of so-called "predatory publishing" (how fast is it growing, how is it changing, how is it impacting research, and more)? How can we reduce misuse of the impact factor (is inventing a different impact factor the answer, and if so, what does this look like in practice)? Can embargoes be reduced or eliminated (and if so, how; we need to generate actual data on this)? What are the demonstrable impacts on research and society of openness (the open access citation advantage is just one such measure; how else are impacts being measured and what kind of quantitative comparisons can we make)? What kinds of open are most effective in what fields and for what purposes (are CC-BY-licensed studies and studies with data used everywhere as intended, how does this use compare with other kinds of study formats, and more)? What global approaches will succeed at shifting the culture of communication in academia toward more openness? OSI has identified 12 such studies that should be considered, and that are foundational to designing approaches to open research that are evidence-based. OSI's study recommendations are flexible. Plan A participants will decide which studies to fund and in what order.

2. **Infrastructure development:** The global scholarly communication community needs new infrastructure items—products, services, tools, websites, and other resources—that will help encourage, achieve, sustain and monitor reforms in this space. Our community should develop these items together, and reasonably quickly, so reforms can be more easily adopted and the scholarly communication landscape can be more quickly and easily improved and maintained. OSI has identified seven infrastructure items for potential development, including an all-scholarship repository (possibly built using CERN's Invenio), an APC discount/subsidy database, an open index of all scholarly publications, an APC price comparison tool, a Yelp site for scholarly publishing, repository upgrades, publisher standards, and an annual "state of open" survey. OSI's recommendations are flexible. Plan A participants as a group will decide which infrastructure items to develop and in what order.

3. **Common-ground work**: There is vast common ground in the scholarly communication community. Most of the groups in this space from across the regional and stakeholder spectrum recognize and respond to many of the same challenges and issues. This commonality exists both within and between stakeholder groups. As a broad, global community, though, we have never taken time to work through our differing perspectives and identify specific ways we can work on these challenges and issues together at scale (there have been many instances of limited sharing and collaboration, including OSI itself, but nothing approaching a global movement to work together). OSI conference delegates have done this kind of work—their ideas and perspectives are summarized in OSI's "Common Ground" policy paper. These ideas and perspectives might be helpful seeds of a broader, global conversation. What are our common goals for the future of open? Can we create a common framework for understanding how open publishing practices overlap with open data, open education, and open code? Can we learn from the open movement writ large to inform and guide what we're trying to accomplish in academia and where we want this work to ultimately lead us? Are there specific common ground solutions identified by OSI that we can move forward with right away? Building on the common ground we have in this community, we have a better chance of developing the right detailed solutions together, in the right order, and for the right reasons, and these solutions will have a better chance of being adopted, sustained, and bearing fruit.

4. **Education/outreach**: The scholarly communication community has overestimated the degree to which researchers are informed and convinced about open scholarship. There is, in fact, a great deal of misinformation and lack of information in this space which is hindering progress. In order to make more and faster progress on open reforms, our community needs to be better informed with regard to "open" definitions, opportunities, impacts, processes, options, and so on (note that some of this information will come by way of new studies that more clearly

identify the impacts of open). Our community also needs a better system in place for listening to stakeholder feedback, and for creating and adjusting to solutions accordingly. Of particular focus on the listening side, we need a clearer and more detailed understanding of exactly what researchers want and need, what they will use, and what we hope to accomplish with reforms so we can make sure to ask the right questions, collect the right data, and pursue the right solutions. OSI has identified three key education/outreach programs to pursue, including international meetings where all stakeholders can discuss the outlines of a new global roadmap for open scholarship (both independently and as part of UNESCO's global roadmap effort), combating predatory publishing through improved awareness and standards, and working together to better understand the needs, goals and concerns of researchers in different disciplines, fields, labs, regions and institutions, and career stages.

In addition to these four main categories of action, Plan A also proposes that, in parallel, we begin taking immediate action as a community to improve the relevance of open research to researchers, and the value of open research to society, by:

1. Opening and centralizing all climate change-related research (to the extent it can be without compromising private health information);

2. Creating zero-embargo compassionate use access portals for patient families and for researchers combating health crises (whether through a new program or by strengthening and expanding the existing Emergency Access Initiative);

3. Creating a more robust Research-4-Life program for lower-resourced regions and institutions; and

4. Considering how to modify current openness programs to improve researcher use and engagement.

FUNDING DETAILS

The following funding details are flexible. Plan A funders will work together to decide which studies to fund at what level and in what order. Plan A funders are welcome to earmark their contributions for specific deliverables listed below, or request that their funding go toward different deliverables (subject to the approval of Plan A's advisory board):

BUDGET FOCUS

Plan A annual revenue (US$)	Studies	Infrastructure	Outreach & Education	Common ground work	Climate change focus	Compassionate use focus
$0				✓	✓	
$50,000			✓	✓	✓	
$150,000	✓	✓	✓	✓	✓	✓
$250,000	✓✓	✓✓	✓	✓✓	✓✓	✓✓
$500,000	✓✓	✓✓✓	✓✓	✓✓✓	✓✓✓	✓✓✓
$1 million +	✓✓	✓✓✓✓	✓✓✓	✓✓✓✓	✓✓✓✓	✓✓✓✓

STUDIES

Priority	Subject	Summary	Estimated cost (US$)	Estimated time required
1	Predatory publishing	What are the exact dimensions and implications of predatory publishing—how fast is it growing, how is it changing, how is it impacting research, and more? This will be a novel analysis using proprietary data. The findings will help guide policy response on this issue.	$75,000	1 year from funding
2	Impact factors	How can we reduce misuse of the journal impact factor? Is inventing a different impact factor the answer? If so, what does this look like in practice? This will be a novel examination involving statistical critiques of the JIF. The findings will help guide development of better tools and practices for assessing impact.	$50,000	2 years from funding
3	Embargoes	Can embargoes be reduced or eliminated? If so, how? This will be the first effort to generate actual data on embargoes via a blind study conducted with cooperation from major commercial publishers. Researcher surveys will also be conducted. The findings will help inform policy decisions regarding how quickly journal articles can be made publicly accessible.	$50,000	2 years from funding
4	Open spectrum	What kinds of open are most effective in what fields and for what purposes? What kinds of open are most desired by field and type of study? How are open and closed data being used today and what are the real-world pros and cons? Research team surveys will be conducted, alongside an extensive literature review. The findings will help align open policies with what researchers need and/or are able to use.	$100,000	2 years from funding
5	Culture of communication in academia	What global approaches will succeed at shifting the culture of communication in academia toward more openness? This study will involve a meta-analysis of existing work in this field, supplemented with surveys of university provosts. The findings will help inform the design of policies geared toward improving the acceptance and adoption of open practices at research universities.	$75,000	2 years from funding
6	Open impacts	What are the demonstrable impacts on research and society of openness? The open access citation advantage is just one such measure; how else are impacts being measured and what kind of quantitative comparisons can we make? This study will involve a meta-analysis of existing work on this topic, including interdisciplinary scholarship on systems. Combined with the understanding derived from other studies, this work will help policy makers and research administrators better understand exactly what impacts are being sought by open policies, what impacts can be reasonably expected, and how policies should change to improve impact.	$100,000	3 years
7-50	Other	Open roadmap development; global flip analysis; global publishing standards development; replicating the SciELO model in specific regions; improving scholarly publishing research; a closer look at publisher profit margins; other	$50,000 each	1 year each

INFRASTRUCTURE

Priority	Subject	Summary	Estimated cost (US$)	Estimated time required
1	APC discount/subsidy database	There are no databases of article processing charges (APCs) or subscription discounts or subsidies. Research4Life leaders have noted that building such resources would be immensely helpful to authors. OSI researchers will collect and input initial APC and discount/subsidy data over a period of six months, after which point publishers and discount/subsidy providers will be given instructions on how to keep their data current.	$20,000	6 months
2	APC price comparison database	APC price shopping may not exist yet simply because there is no tool to help facilitate this (price is a factor, but surveys have shown that authors care more about quality and impact than price). An APC price comparator tool might therefore be of service to the global scholarly communication community. No such tool currently exists. The development and deployment of this tool would need to proceed with care. While providing price information is valuable, we don't want to help promote fake journals either.	$20,000	6 months
3	Global open indicators + annual survey of open	Our community needs some way to better assess, on a regular and comparable basis, how much open exists and where, and where we need to focus our efforts for more improvement. This task can be triangulated upon from several angles, including an annual survey of the state of open (current surveys are irregular and don't have a common baseline or common methodology), and a global open indicators tool that can measure open more granularly and by region, country, field, etc. (the indicators tool may be developed in collaboration with UNESCO).	$75,000	12 months to develop + 2 months/year thereafter
4	Journal whitelist/blacklist lookup	This system-wide lookup tool will be used to verify whether a journal is listed on a particular index, and will help dissuade citing non-indexed and possibly suspect work. Journals will be encouraged to adopt an editorial policy whereby if a referenced journal does not appear on a whitelist, then authors must justify the citation.	$50,000	18 months to develop pilot

5	Yelp site for journals	OSI will build a few tools that have wide "category-killer" appeal and real paradigm-shifting potential for scholarly communication. A Yelp site for journals is one such tool. The core purpose of the Yelp site is to provide an easy-to-use, familiar-looking interface where customers (authors, editors, reviewers, funders and more) can rate scholarly journals and where publishers can provide important contact and product information—a link to their website, a summary of their products and services, links and credentialing badges that verify data such as indexing and impact factors, and much more. Customers will be able to search this database for publishers in their field, price range, region and more—like the actual Yelp site, searches can be filtered in a wide variety of ways. Customers will also be able to provide reviews regarding their experiences with publishers, which will help round out the data provided by Cabell's blacklist and other information sources. Ad revenue will help support the upkeep and sustainability of this product, with excess revenues accruing to OSI toward the development of OSI's other products (and studies); sponsorship support will also be important. This will be a complicated product to develop, launch and fine-tune, and very labor intensive as well.	$100,000	18 months to develop pilot
6	All-Scholarship Repository	The All-Scholarship Repository (ASR) is the ultimate game changer in scholarly communication. Rather than continuing to rely on (and expand) our global network of institutional and national repositories, and then exert herculean and ultimately inadequate efforts to connect the meta data in these repositories (which ends up only providing a glimpse into the contents of each repository, not full access to the contents themselves—at least at the moment), ASR jumps over this step and instead creates a single warehouse for all scholarly research content. In terms of architecture, ASR would be single database with many spokes—many independent owner/operator channels through which data can be added and outputs can be customized. The central ASR database would be replicated and archived continuously; it would also be cloned by owner/operators. A fuller description of the ASR concept and operation is available in the appendix of OSI's February 2015 report (OSIWG 2015).	$350,000	2 years to develop pilot version
7-50	Other	There are many good ideas floating around the scholarly communication community—developing an open impact factor, a global journal index, an iTunes-like single article download site, or global publishing standards; better funding existing infrastructure like DOAJ; and more. The Plan A funding group will decide which of these projects to prioritize.	Approx. $20,000-$200,000 each	Appox. 2 years for each pilot

OUTREACH/EDUCATION

Priority	Subject	Summary	Estimated cost (US$)	Estimated time required
1	Global Open Access Portal (GOAP)	Built in collaboration with UNESCO, this portal will be a comprehensive resource for all open-related information, organizations, definitions, processes, and so on.	$25,000 annually	6 months for pilot, 10 hours/week to maintain
2	OSI briefs & reports	OSI has accumulated a wealth of knowledge over its four years of operation. We are publishing readable two-page issue summaries (briefs) and longer policy papers that consolidate and translate this knowledge for lay audiences. A few of these have been published to-date; many more are planned. These materials will be a central component of UNESCO's GOAP.	$15,000 annually	1-2 months per report
2	Misc. education	A variety of one-off education efforts are needed for specific purposes—-for instance, to combat predatory publishing through improved awareness of this issue.	Varies	Varies
3	Misc. engagement	A variety of "engagement resources" are needed for bringing together the scholarly communication community (not events, which are described in the "Common Ground" section). For instance, our community needs an annual report similar to what the STM Association publishes annually on the state of STM publishing.	Varies (at the high end, $50,000 annually for survey or report)	Varies
4-50	–	There are a number of high priority needs in this space. The Plan A funding group will decide which of these to prioritize, with a focus on funding projects that provide broad and nonpartisan background on open (not projects teaching that open looks like x, or trading in negative stereotypes about publishers or other stakeholder groups, but projects that teach what open means to various constituencies, the benefits of open, ways to engage in open, etc.)	–	–

COMMON GROUND WORK

Priority	Subject	Summary	Estimated cost (US$)	Estimated time required
1	UNESCO open roadmap	Continue helping/advising UNESCO in creating a UN-wide roadmap for the future of open science	–	18 months

2	Meetings	Meetings are needed all stakeholders can discuss the outlines of a new global roadmap for open scholarship (both independently and as part of UNESCO's global roadmap effort), and where diverse groups can work together to better understand the needs, goals and concerns of researchers in different disciplines, fields, labs, regions and institutions, and career stages.	$50,000 per meeting	4 months planning and follow-up per meeting
3	Surveys	We need a clearer and more detailed understanding of exactly what researchers want and need, what they will use, and what we hope to accomplish with reforms so we can make sure to ask the right questions, collect the right data, and pursue the right solutions.	$20,000 per survey	6 months
4-50	–	The OSI2016 and 2017 workgroups came up with a long list of recommendations for collaborative actions in the scholarly communication space. These should be carefully looked at by the Plan A group as possible projects. See the OSI2017 report (on the OSI website) for details.	–	–

CLIMATE CHANGE FOCUS

Priority	Subject	Summary	Estimated cost (US$)	Estimated time required
1	Open policy meetings	Climate science is closed relative to many other fields. Figuring out how to make it more open is critical—to enable scientists from all countries and from all fields related to climate science to share their data more freely on everything from atmospheric carbon removal technology to methane capture to temperature modeling.	$50,000 investment per meeting (net invest is $0)	4 months planning and follow-up per meeting
2	Education conventions	Conventions are needed to educate business and policy groups about the range of existing tech options for carbon and methane capture. Presentations should also take place at these meetings on barriers to action, risks of uncoordinated action, forming international networks for investment and action, etc.	$100,000 investment per meeting (net invest is $0)	4 months planning and follow-up per meeting
3	Action frameworks	Once the data is clear and the barriers and risks have been assessed, action frameworks can begin taking shape. Openness will be key in this—establishing frameworks built on discoverable information, communicated clearly to policy makers and the public, with clear, sound, accountable objectives in mind and strong sustainability.	$75,000 annually	6-12 months to begin making measurable progress
4	Replicability	Once developed, OSI's climate change model can be replicated to other research challenges.	–	–

COMPASSIONATE USE FOCUS

Priority	Subject	Summary	Estimated cost (US$)	Estimated time required
1	Open policy meetings	Compassionate use access to medical research is spotty. Publishers have some one-off mechanisms in place for daylighting research during times of global health crisis (such as COVID-19 research. Several international conventions also exist. However, there are no turn-key procedures or resources in place. Figuring out how to make critically needed health and medical research available to researchers and policy makers (as well as individuals researching cures for loved ones) will fill an important needs gap in the scholarly communication space. The first step is to meet to talk about needs, gaps, barriers, possible solutions, etc.	$50,000 investment per meeting (net invest is $0)	4 months planning and follow-up per meeting
2	Action frameworks	Once the challenge is clear and the options have been assessed, action frameworks can begin taking shape. Openness will be key in this—establishing frameworks built on discoverable information, communicated clearly to policy makers and the public, with clear, sound, accountable objectives in mind and strong sustainability.	$75,000 annually	6-12 months to begin making measurable progress

WHY?

Scholarly communication tools and practices have been evolving for decades now. Where they end up decades from now is truly anyone's guess. Until then, there are many issues that need to be resolved, and many reforms that should be pursued.

So what's the holdup? Nothing really. There are a large number of organizations in the scholarly communication space who are working on reforms. Some of these groups are working together, most are not. Overall, our progress toward a more open research world has been growing steadily, although much progress remains to be made.

Or at least some people see it this way. Others are convinced that not nearly enough progress has been made to-date, which isn't wrong—they're just measuring progress differently. There are fundamental disagreements in scholarly communication about what kind of reforms we should be making. Some feel quite strongly that commercial publishers have no place in the future of research and that no reforms are complete unless publishers are excised from the picture. Others feel quite strongly that publishers have a centuries-long track record of serving the research community and that the tools and processes put in place by publishers are essential to retain because they facilitate good research and are valued by the research community. Still others are caught somewhere in between—-yes, publishing is valuable, but exactly what is "publishing" in the digital age, and can't we do things more efficiently today than in years past?

There is also a wide range of disagreement over how fast needed reforms can and should happen. "Right now" is too slow for some, and "ten years from now" is too fast for others. On the fast side, advocates see the need for the immediate daylighting of research information that could cure cancer and reverse climate change. On the slow side, advocates see the need to move with caution lest we damage research with rash and ill-considered changes.

Aside from issues directly related to open access reform—what kind of open and how fast—there are also many persistent issues in this space that will require global cooperation to solve. The misuse of impact factors is one such issue, for instance. Impact factors at their most innocent simply tell researchers which journals are more important than others. At their most sinister they are used as a proxy for quality and drive publishing behavior that works at cross purposes to a more open world (what researcher, after all, wants to publish in a small start-up journal that is free to read if the real credit and glamor comes from publishing in the New England Journal of Medicine).

Plan A isn't advocating one particular approach or time frame, but rather a necessary and inclusive process. By working together—however quickly and aggressively we decide to do this as a community—on realistic, robust, collaborative solutions that improve the capacity of research for all researchers everywhere, Plan A's vision is that we will arrive at solutions that are both sustainable and highly effective—much more effective than any "solutions" imposed by outside groups with their own biases and agendas.

Indeed, Plan A's vision is that by working together, and only by working together, we will eventually—maybe 15 years from now, maybe less, maybe more—-arrive at an "Open Renaissance" where the research ecosystem will grow exponentially more powerful as more open and connected data catalyzes more innovation and improvement. New fields and directions will emerge based on "connecting the dots," funding efficiency will improve, and discovery will accelerate; the social impact of research will exceed today's levels (including improved literacy, public engagement, and public policy impact); and knowledge will become more of a global public good, with society reaping the benefits.

GUIDING PRINCIPLES

This work will be guided by 12 general principles that represent a global, multi-stakeholder, common ground perspective on the future of scholarly communication. Plan A's work and work products will be:

1. **Researcher-focused**. Research communication tools, services and options need to be developed with heavy input from the research community, with solutions and approaches driven by researcher needs and concerns.

2. **Collaborative**. Successful and sustainable solutions will require broad collaboration, not just to ensure that all perspectives are considered, but also to ensure there is broad ownership of ideas.

3. **Connected**. There are a great many interconnected issues in scholarly communication. We can't just improve the openness of information without also addressing issues such as the current functioning of impact factors, peer review, and predatory publishing. Reforming scholarly communication will require a systemic approach.

4. **Diverse and flexible**. There are no one-size-fits-all solutions to scholarly communication reform. Instead, there are many different pathways to reform, including many that have not yet been conceived or deployed. Diversity, creativity and flexibility in this undertaking should be encouraged, at the same time noting that we should try to maximize adherence to the other principles represented here.

5. **Informed**. We need a better understanding of key issues in scholarly communication before moving forward. For instance, what is the impact of open research? The more accurate and honest our assessments, the more accurate and honest our reform efforts can be, the easier these efforts will be to promote, and the more successful they will be.

6. **Ethical and accountable**. We need enforceable, community-developed/driven standards to ensure the integrity of journal publishing, repositories, and other related activities/products, and to ensure that unethical approaches are not embraced.

7. **Common goal oriented**. We must discuss and plan for what the future of scholarly communication means, beyond just having access. For instance, we need to identify precisely what we plan to do with open information, where we will need data interoperability, what tools and procedures we will need to achieve this interoperability, and so on. By doing this, we focus on and strive for our community's common goals.

8. **Equitable**. Researchers everywhere need to be able to access and contribute information to the global body of research information with minimal barriers. To the extent practicable, research information—particularly information central to life and health—should not be unreasonably constrained by issues such as high access costs, poor journal indexing, and a lack of capacity-building programs.

9. **Sustainable**. Scholarly communication reform approaches need to be sustainable, which flows from all the other elements in this list. That is, the reform solutions we design need to be achievable, affordable, popular, effective, and so on.

10. **Transparent**. This community needs to maintain as much transparency as possible in this effort (with regard to pricing, usage, ownership, and so on) in order to address the trust issues that have plagued this space for so long.

11. **Understandable and simple**: This community needs to agree on a few simple, high-level, common-ground goals for scholarly communication reform—not anything specific with regard to publishing requirements, for example, but a general set of goals that are understandable, achievable, and adaptable. By setting out general goals that can be easily achieved, participation can be made simple and easy, with low barriers to entry.

12. **Beneficial**: In the end, these reforms need to benefit research first and foremost. While the argument to improve benefits to society is central, these benefits need to be matured carefully, deliberately, and realistically in order to ensure that societal benefits are indeed being conveyed as intended, and that research is not being harmed in the process.

ENACTMENT

It is important to note that the global "scholarly communication community" addressed by this Plan A is vague and amorphous. However, this community also has much in common, and it shares common goals and interests (see OSI's "Common Ground" paper for more detail). It is in this broad sense that we speak of community—not with the unrealistic expectation that every organization currently working in this space will or should stop what they are doing, leave their disagreements aside, abandon their own priorities and join hands, but with the knowledge that ample common ground exists in this community to support common action that benefits everyone everywhere. The vast majority of stakeholders in this space are not, after all, ideologically attached to any one particular approach—most are simply trying to figure out what to do with regard to open policies. In addition, even groups who may be invested in one particular approach or perspective share a common desire to improve open. The contributions to openness supported by this plan—studies, infrastructure development, common ground collaborations, and education/outreach—will help all groups in this space and will help advance open for everyone.

With regard to enacting this plan, participants will decide how best to jointly manage Plan A and its activities. OSI will be the initial manager until such time as decided otherwise by the group, under a governance plan to be released at a later date. The goal is for Plan A to be fully operational by mid-2020 (i.e., beginning to work on targeted projects, studies, outreach, and other to-do items), with work continuing for as long as funding and interest continue.

FEEDBACK

Feedback on this plan from the global scholarly communication community is welcome. Comments should be sent to info@osiglobal.org. This plan will be revised over time in response to this feedback, and also in collaboration and consultation with UNESCO's open research roadmap effort.

FAQS

1. Where's the beef? I'm looking for a bold plan with lots of action.

    - Finding a common ground starting point for action is vital. What the scholarly communication community needs is a respectful, collaborative effort to work together on solutions that everyone has a say in developing and that will benefit everyone everywhere. Assessing the wealth of recommendations from OSI2016 and OSI2017 workgroup participants (see the OSI2017 report for details), the most frequently mentioned crosscutting issues were the need for more studies and the need to reform the culture of communication in academia. The most frequently mentioned approaches for reforming scholarly communication were studies, coordination and collaboration, outreach, new tools and programs, improved standards, pilots, resource development, and policy leadership. Plan A's focus is derived from these recommendations, overlaid with what the OSI group has learned and observed since these meetings about our internal strengths and about the environment for global reform. Specifically, what can realistically be accomplished and has the greatest chance of serving as a foundation for real and lasting improvement? Plan A is it, and from this effort, trust, accomplishments and progress will build and grow.

2. Is this a manifesto or a plan?

    - It's both—a description of the need to come together to solve a very important problem, and the mechanism for doing so.

3. This is for the benefit of publishers, right?

    - Wrong. Publishers need to know what to do. Plan A provides a framework for action that allows everyone to work together instead of everyone rowing in different directions.

4. Is OSI pro-publisher?

    - OSI is pro-stakeholder. Everyone deserves a seat at the table, even publishers, who have been targeted for years as being somehow culpable for not providing more information free of charge. The reality is that "free" isn't a sustainable business model. If we value what publishers bring to the table—gatekeeping, evaluation, editing, structure, organization, dissemination, and global integration—then we need to work with them to create effective and sustainable change. If we prefer to wipe the slate clean and start all over again, that's an okay perspective too, bearing in mind that this approach has risks and may result in simply reinventing the wheel and ending up with the same costs and issues as before, just different players.

5. This is a lot of work. Who pays for it?

    - No one yet. OSI is currently (as of March 2020) seeking support for this plan. Our hope is that at least some of the larger signatories will be willing to each contribute a small amount of support to help get the ball rolling.

6. A lot of Plan A hinges on having adequate support. Is this a problem?

    - Yes and no. There is plenty for us to do in the short-term absence of full funding (see funding section for details)—continuing to write grants, write briefs, plan studies, build alliances, advise UNESCO, and more. This said, funding may be on the horizon for specific deliverables. Also, as Plan A gets promoted, funders may come on board (whereas if they haven't supported OSI in the past, this may be because OSI itself wasn't proposing to build anything).

7. What's the relationship between OSI and Plan A?

    - Plan A is an invention of OSI, representing the collective wisdom of OSI participants. However, in order to ensure that Plan A can grow and evolve in accordance with the wishes of the organizations who sign this plan, the current intent is for Plan A to become an independent group by the end of 2020, with its own management structure and governance rules. OSI will retain a seat on the Plan A board, and will likely continue to provide the bulk of Plan A's financial support.

8. Why 5 years? Why not now?

    - The open access movement has been pushing for "now" solutions for the past 20 years. They don't work, because "now" is not an acceptable substitute for appropriate consultation. The scholarly communication community has many stakeholder groups with a stake in the outcome of reform measures. It is essential, both for the success of these reforms and for their long-term sustainability, that the first step in these efforts involves bringing everyone together. From there, who knows? Maybe real reform will take only four years? But continuing to pursue "now" solutions for another 20 years isn't the right approach.

SIGNATORIES

Groups that sign Plan A indicate a willingness to working together to fulfill the plan's goals. A current list of signatories will be available online.

ANNEX

STUDIES

OSI will begin conducting studies that target key issues in scholarly communication where a lack of firm understanding is making it difficult to create effective policy reforms. These studies will be "leveraged" through OSI, not outsourced. That is, OSI has enough internal and volunteer capacity to do all the study design, oversight, writing and analyses in-house. Grant funds will be used mostly for data-gathering and statistical analyses. The OSI team will identify and hire researchers as needed (some may end up being OSI participants already) who can conduct original research work as needed, and hire statisticians as needed to crunch numbers and maybe take a first pass at analysis, but the final writing and analysis will be done in-house by OSI participants. In this way, we can get the most studies possible with the smallest outlay of time and money. The studies we will conduct are as follows:

- **DECEPTIVE/PREDATORY PUBLISHING**: Exactly how fast is deceptive/predatory publishing growing, how much of it exists, and what are its dimension (by region, discipline and so on)? Very little definitive is known about this phenomenon, and yet it is perhaps the single most disruptive influence in publishing today (Anderson 2019; Strinzel 2019). As more emphasis is placed by libraries and funders on open access publishing, more open access publishing options are becoming available to authors. Some of these options are legitimate, some are not. This study will describe what we already know about predatory publishing, and will also enlist the aid of leading researchers who are part of OSI to suss out long-term data about the growth of predatory titles over time. A rough outline of this study is as follows:

Title: Using new and improved data to assess the academic journal landscape

Section	Description	Pages	New or novel?	Notes	Lead author?
Intro	Overview	0.5	No	Why can't we just do a count in Google? Well, for one, they won't let us. Second, there's no accounting for quality. The future needs to be built on systems that are reliable and accountable.	Glenn Hampson
What is a journal?	Essay	1	No		Rick Anderson
The growth of journals and journal articles	Statistics	2	Yes	This is a known concept but will use new/better data from 1findr	Eric Archambault
Breaking down the nature of this growth	Statistics	3	Yes	Same as above. Focus on regions, disciplines, rates, and types (open, subscription, hybrid, other; predatory, indexed, non-indexed), plus—from other studies—how this compares to growth rates for "other" types of science communication like white papers, blog posts, preprints; who is publishing and why; etc. (from other studies)	Eric for new material, Glenn for rest
Discerning legitimacy	Overview	0.5	No	A quick case for how we define real science publishing and how evolving publishing norms are making it easier to push these boundaries	Rick
The statistics of legitimacy	Stats	4	Yes	A detailed look at what Cabell's is doing, plus a detailed breakdown of the predatory landscape (rates, regions, disciplines, etc.), as well as a breakdown of what kinds of "violations" exist. How much of this "predatory" work is mixed in with real work, and how does this change the growth estimates that Eric came up with? This will need to be broken down by region and discipline—the aggregate numbers won't be revealing.	Simon Linacre

Testing assumptions	Stats	4	Yes	Random sample Google search results in various topics from different parts of the world to if what comes up in Google searches matches what "should" come up in terms of significance and legitimacy. [This is important insofar as GS is the primary search mechanism for a majority of the world's researchers.] For instance, does searching for "cancer vaccine research" return real work more often than not, or lots of predatory work? Understanding this will help us understand how worried we should be about fake science corrupting our knowledge base.	Not sure
Re-thinking the landscape	Informatics	2	Yes	How else can we visualize what's happening in scholarly publishing? For instance, would it make more sense to group journals into "read" and "not read" (and/or relevant and not relevant, compliant and/or noncompliant, etc.)? By audience saturation? Etc. In other words, is it necessary to think in terms of the growth of articles and journals if what's actually being used/read is remaining essentially unchanged (save for new journals covering new fields), or if journals are born and quickly die?	Glenn et al
Issues and recommendations	Policy	3	Yes	What are the issues that are important in this landscape (like inclusion and preservation), and what issues are preventing us from tracking academic scholarship more closely (ISSN errors, naming differences, indexing problems, completeness issues like poor inclusion of SciELO journals, etc.), how prevalent are these, and what can/should we do to remedy these? Is a global open index a solution (plus a global open impact factor)? These ideas will be explored more fully in a forthcoming OSI project.	Glenn et al

- **IMPACT FACTORS**: Impact factors are one of the most destructive, most corrosive measures used in science today (OSI 2016a, Bosman 2013). They are also one of the most important and widely used. How can both of these statements be true? Because impact factors are the statistic we love and hate—we know they are more or less meaningless (Lozano 2012), but we also know that high impact factor work translates into promotions and grants. And so we turn a blind eye to their shortcomings and keep using them. Much has been written about the use and misuse of impact factors (i.e., explaining what they were intended to measure versus how they are promoted), alternatives to the impact factor, and calls for broadening the metrics we use in assessments (particularly RPT). But nothing has ever been written about the statistical validity of this measure. In fact, the impact factor isn't mathematically valid at all for the purposes of measuring "impact" (for several reasons—the most significant of which are that this is an aggregate journal level metric and not an article level metric; also, citation counts are just aggregate, not positive or negative, so a bad article could be highly cited as an example of what not to do. After dissembling the mathematical foundation of impact factors, this study will propose how to remake the impact factor to improve its use. It will also rethink policies regarding how we use future impact factors in order to avoid perpetuating the "arms race" situation we have now where publishing in high impact factor journals is seen (incorrectly) as a proxy for quality, relevance and impact (dissembling this narrative will require evidence). Finally, this study will review the existing literature for an explanation of why we use these measures in the first place (plus an overview of who uses them and how), and review other proposed means of measuring impacts (existing tools, new tools, etc.). One final approach that may also be explored as part of this paper, depending on how far along the development of a proposed product has progressed (see "open impact factor + open index") is a new "open impact factor" measure (built on the new math but using a global index) that everyone can have/use and that doesn't discriminate

against small/new publishers. Currently, only journals indexed by Clarivate (representing a narrow and elite set of journals) can have an actual impact factor calculated; everyone else needs to use a fake impact factor (like the Global Impact Factor) or invent one out of thin air. Creating an open impact factor will first require creating a global index, which is described in more detail in the open impact factor + open index product proposal.

- **EMBARGOES**: How necessary are embargoes? Publishers insist that a 6-12 month delay is necessary between publication and free public access in order to protect subscription revenues. Critics contend that this time could be shortened—that there are other ways to protect revenue streams that don't involve long paywalls. To-date, the only estimates of ideal embargo length have come from citation half-life studies. In order to generate more "real" data on this matter that directly answers the question of how long is too long (instead of inferring this from half-lives), we will conduct a blind with the cooperation of publishers (Elsevier volunteered to participate in this study in 2016; we will revisit this offer and see if we can also include other publishers). This study will reduce or eliminate embargoes for a select number of publications and will monitor this impact of this action on revenues. If the impact is negligible, the evidence may suggest that embargoes can be shortened (or that revenue loss can be offset through other value-added access means—e.g., increasing access to the article but not the dataset, which will lead to more purchases of the dataset). The need for embargoes remains a major sticking point in open debates. Figuring out how to make progress on this issue is important to the future of open.

- **IMPACTS**: Not to be confused with "impact factor," understanding the actual impacts of open in research, education and society is vitally important. This is more of a meta study than anything, but it's needed to better "sell" the advantages of open (or to better understand why open is not selling and what we really need in open—more standardization of data, for instance). The OA citation advantage is the most visible attempt so far to quantify open impact, but studies trying to measure even this one statistic have reached different conclusions to-date. Eric Archambault's most recent study (Science-Metrix 2018) is the most authoritative, but even this study didn't look at the full spectrum of open products, just "gratis" (which crosses several categories of open). What we need to know is much more granular: what kinds of green open are the most effective (for instance, the green in institutional repositories, or on preprint servers, or where?), how well is gold received by researcher (and what type), bronze, public access, and so on? In other words, exactly what kind of open is needed to improve visibility and reuse? What kind of open works best and why (what factors are most important—readability, findability, reusability, all of these, or none of the above)? What measures other than citation might we use to triangulate on actual impact (since citations can be influenced by press coverage, topic salience, etc.). What correlates can we note between open and research uptake, R&D investment, and more? The entire corpus of open work to-date has taken it as an article of faith that all open is created equal and that open itself—vaguely defined as it is—is meritorious. We need to get a clearer idea of what we're working to achieve and why, beginning with understanding how the current constellation of open outcomes are being received in the marketplace. (Possible OSI research leads: Rob Johnson, Caroline Wagner, Eric Olson; Rob's possible time frame for working on this is June-Aug 2020)

- **PUBLISHER PROFIT MARGINS:** A major point of contention in this space is how much profit Elsevier makes. Critics say 37 percent. The company (in correspondence with the OSI list) says much less—that Elsevier's income and expenses are entangled with those of its parent company RELX and that revenues come from many sources not related to academic publishing. A clearer picture is simple enough to arrive at by hiring auditors to examine the books (not just of Elsevier but other major publishers as well) and issue an authoritative analysis, and also by reviewing the scholarship on how to properly interpret profit margins within and across

industries. We will also review the landscape of funding and costs for universities to see how publishing fits into all of this. Charges of profit-mongering and double-dipping have fueled attacks on commercial publishers or at least 15 years now and these attacks have been used as an excuse to keep publishers from participating equally in global conversations about the future of open. To the extent we can help shed more understanding on these numbers, it will help provide a firmer foundation of transparency and realistic expectations for open reforms. In order to develop a fuller understanding of the underlying tensions in this debate—it's largely just a push and pull between libraries and publishers, with each accusing the other of financial misdeeds— we may also find merit in expanding this study to include a look library finances as well. The publishers with whom we have spoken are willing to participate in this study insofar as providing requested data.

- **CONNECTEDNESS/STANDARDS/ROADMAP**: How related are different concepts and applications of open (across coding, books, journals, etc.), and where can we merge these concepts, applications and even open efforts? As we (not just OSI, but the United Nations, scholarly societies and others) begin developing new roadmaps for the future of open, it behooves all of us to collaborate not just within scholarly publishing, but between journal publishing, book publishing, data science, and so on. OSI is actively pursuing partnerships in the roadmap effort on several fronts but needs to have a roadmap of its own showing who is working on what, what concepts overlap, what concepts differ, and how this landscape of interests and perspectives fits together. From this work, it should be possible to create a new global conversation around global open standards and a global open roadmap built on common ground and connectedness and that applies broadly to all fields and all open efforts. From this position, we can establish policies that are flexible and adaptable and that all pull in the same direction toward more open. A study like this hasn't been conducted before—this would be a first attempt to define the full landscape of open.

- **NEEDS**: Tying in closely to our impact study, the scholarly communication community also needs a study that looks at how much open is needed by field (for instance, is CC-BY licensing always necessary everywhere)? As noted in the impact study description, open efforts have long proceeded from the assumption that we know what works and what the market needs, but in fact we have no idea. This study would first survey existing literature to get a fuller picture of what we already know with regard to researcher wants (primarily various author surveys conducted over the years by publishers and universities). Information gaps would then be filled via new, global surveys, facilitated with the assistance of Editage/CACTUS and others in OSI who have volunteered to help. Getting a broad sense of this demand across regions and institutions, as well as across disciplines and faculty types (as is usually done) is critical insofar as trying to ascertain global needs and perspectives and not just Northern/Western needs. Getting a better sense of what kind of open we should be working toward is also critical. The impact study will look at this from a market perspective, assessing what's being used. The needs study will look at this from an aspirational perspective—what needs are present that are not being met? Do current solutions align with marketplace options? Is there alignment between what researchers are asking for and what the marketplace looks like?

- **PUBLISHING IN RPT**: Publish or perish has been the norm in academia for decades now. This dynamic is not abating; indeed, it's accelerating (Plume 2014). Around the world, we see a wide variety of influences that are causing the number of research articles to stay high, including requiring publishing for a PhD (India), awarding cash bonuses for publishing in high-impact journals (in China; Montgomery 2018), having journal articles ghost-written for you to improve resumes (Russia), and everywhere, having more opportunities available to publish (faster, at lower cost, as part of large multi-author teams, as part of grant requirements—regardless of whether study findings are complete or meritorious, as salami-sliced articles, as a consequence

of increased specialization, and more. Concurrent with this avalanche of paper, there is also increasing sloppiness in the system wherein tenure committees aren't necessarily valuing the quality of publications—that is, publishing in predatory journals may not always be noticed or questioned (Shamseer 2016). OSI has debated this issue at length and there aren't any good answers. Do we expand the scope of what "counts" in publishing to include blog posts, videos, press interviews and more? Do we lower the bar and allow preprints to count for more? Do we create professional standards such that publishing in an non-indexed journal (see tech project on indexing) is disallowed. Or even more aggressively, do we create standards that say publishing in such journals is unethical? OSI isn't the only group that has debated this issue. What is needed is a landscape analysis of RPT practices worldwide with regard to publishing. From this analysis, we will develop a set of best practices recommendations for UNESCO and national departments of education. Once we lower the pressure to publish in academia, it will become easier to rationally discuss and implement solutions aimed at improving the quality and quantity of research publishing. Until then, and without addressing this systemic issue, reform measures will simply be reactive.

- **PEER REVIEW**: Peer review is what separates vetted science from non-vetted science. It's a critical part of the current scholarly publishing ecosystem. Peer review is also unpaid labor and an incredible burden to many in academia. To this end, different methods of peer review are evolving and being tested—for instance, post-publication peer review, which allows articles to be quickly shared and then refined via broad feedback in real time online. Peer review is also being faked—deceptive journals promise peer review but deliver only a cursory editorial review instead, if that. OSI has debated this issue at length and is well-positioned to author a landscape analysis of the current state of peer review, along with best practices recommendations for UNESCO and national departments of education. Without figuring out the right way forward for peer review, our open efforts will flounder—we can't create more open without ensuring the scientific integrity of these articles. We also need to develop and share best practices with the global community in an authoritative way, which this landscape analysis will facilitate. This effort will be focused on settling the highest priority concerns in peer review (Tennant 2019): what is peer review anyway, what value does it add, how do we define expertise, how do we protect diversity and more. These questions will be answered through broad stakeholder polling and consensus. This study will be part fact-finding, part survey, part consensus cultivating, and will involve meetings, email discussions, proposal drafts floated to institution heads, and collaboration with standards agencies like NISO and editorial agencies like WAME (which all participate in OSI).

- **GLOBAL FLIP**: California's library system, cOAlition S, MPDL's OA2020 Initiative, and other influencers in global scholarly communication system all believe quite firmly that a global "flip" to open is economically feasible, wherein closed subscription publications convert to APC-funded open publications. This belief is grounded at least in part in a 2015 study from the Max Plank Digital (Schimmer 2015) suggesting that the world has enough capacity to make this flip possible and that costs will come down as a result of APC competition. These data have never been examined closely in another research piece (they have been challenged in numerous blog posts since then) but they need to be so the global community can assess this strategy more objectively. Mounting evidence suggests that authors do not comparison shop for APCs (Tenopir 2017), so there is no downward pressure on prices. What we have instead are escalating prices, and a shifting of the cost burden from institutions to authors, all of which is only widening the gap between haves and have-nots. Are APCs the way to go? Maybe, maybe not. The fact is we don't know. More research is needed. This study will go back to square one and re-examine the data and assumptions of the original global flip study, updating data points and re-examining assumptions such as price competition based on new studies. It will then look at the variety of pricing models that have emerged in the global publishing system over the last

10 years (such as PAR) and estimate what may actually be possible—that is, estimate what the market may actually be looking for and what reforms may be achievable. Based on this analysis, this study will search for the "sweet spot"—maybe, for instance a global flip to PAR in 10 years bracketed on the high and low end by layers of subscriptions and preprints, or whatever the case may be. This analysis is important insofar as trying to visualize the end-zone for reforms. We know what problems exist and what changes need to be made. What we don't know is where the market is headed. Having a better idea of this will allow the global community to start pulling in the same direction and improve collaboration on measures that aim for the same goal.

- **GLOBAL RESEARCH PUBLISHING STANDARDS**: Figuring out how much deceptive/predatory publishing exists, what it looks like, who is using it and why (see previous study proposal on deceptive/predatory) is just part of the effort to improve global research publishing. Another critical part is to figure out what research publishing standards we need. Several organizations in scholarly communication have discussed best practices over the years (most notably editorial and umbrella groups like NISO, WAME, COPE, and OASPA), but these discussions have stopped short of creating and issuing internationally-backed recommendations for publishing standards and the methods for enforcing these standards. This study will first gather together best practices recommendations that have been discussed to-date, update these with input from the organizations represented in OSI (which includes editorial and umbrella groups plus over 200 other organizations), and then evaluate realistic measures for creating and enforcing standards for the global research publishing community which will be observed not just by publishers but by others as well—most notably funders and universities. The goal of these standards will not be to erect barriers to publishing, but to map out the boundaries of what we mean by "open," "publishing," "peer review," and other terms that lack a clear definition. These standards will also define the minimum expectations we should have for publisher competency so that the global research publishing enterprise as utilized by universities in particular is consistent and well-defined. Since this study will rely on findings from several other OSI studies, it will need to wait until these other studies are complete before beginning. Creating thoughtful, fact-based, widely-adopted standards for global research publishing is critical to ensuring that research publishing grows in a way that represents the needs of researchers and not just market forces (e.g., less deceptive publishing, less pressure to publish in journals, etc.).

- **REPLICATING THE SCIELO MODEL:** SciELO is one of the most unique organizations in the world of scholarly communication. It is a soup-to-nuts provider of everything from publisher training to editorial services to data management and repository management, serving as a pioneering open access network and hub for dozens of journals across Latin and South America. It is a model for how the publishing industry should evolve in the global south to ensure improved focus and better access. We will undertake a study to determine the feasibility of expanding SciELO from Latin and South America to CAMENA (Central Asia, the Middle East and North Africa), Sub-Saharan Africa, and SE Asia. Is there a need in these regions? Interest? Potential financial support? Should these new SciELO's operate independently or in cooperation with one another? Based on the outcome of our study, we will then approach UNESCO and other possible funders and partners with financing and development proposals (note: an initial version of this plan was raised last year at SciELO-20 with the heads of SciELO and its parent body FAPSEP, as well as UNESCO).

- **IMPROVING SCHOLARLY PUBLISHING RESEARCH:** The majority of research into scholarly publishing-related issues and reforms isn't adequate. This is an impossible statement to corroborate—it's an observation based on the volumes of research the OSI group has reviewed over the past four years. Too much of this research exhibits a fundamental misunderstanding of the nuances in this field. In an effort to promote better research, we will research and publish a

paper that describes the conditions researchers need to keep in mind when doing open research. For instance, when researching predatory journals, Beall's List should not be used as a starting point since this list is not transparent and is no longer supported (i.e., the criteria for inclusion on this list were always taken on faith—Beall never made these criteria public—which is not how science should be done). Also, we cannot assume "open" means the same thing as open access. Too much research tracks "open" without understanding that it exists in many variations, and gold/green CC-BY open is just one such variation. Also, we cannot treat databases like Scopus are being representative of all journals. This database is, in fact, narrow and highly selective. There are many more observations about scholarly publishing research we've noted over the years; publishing this as guidance will help improve the quality of future research work in this area.

- **OTHER**: The OSI group is constantly talking. It's quite likely that other study ideas will be raised. If some of these ideas are meritorious, they will be added to this grant proposal with permission and pursued if possible.

INFRASTRUCTURE

OSI will also begin developing tech products and solutions that fill key needs in the scholarly communication ecosystem where a lack of government and/or private sector action has hindered the progress of open reforms. As with OSI studies, these products and solutions will be "leveraged" through OSI, not outsourced. That is, OSI will design and oversee development in-house, and NSF funds will be used for certain programming and other work that cannot be handled in-house. The OSI team will identify and hire personnel as needed (some may end up being OSI participants already) who can conduct this work as needed, but the final design decisions and assessments will be done in-house by OSI participants. All of these products and solutions will fully deploy before 2025. Grant funds (if available) will be used to maintain these products and solutions over grant periods, but all solutions will become self-supporting through various combinations of advertising, sponsor fees, and member fees for content providers (none of these products/solutions will have user fees for basic access, although premium access models may emerge as a means of support). The products/solutions OSI will consider building are:

- **APC DISCOUNT/SUBSIDY DATABASE**: There are no databases of article processing charges (APCs) or subscription discounts or subsidies. Researchers looking for charges, discounts or subsidies need to search for these one at a time. Research4Life leaders (who are part of OSI) have noted that building such resources would be immensely helpful to authors, particularly those from the global south where discounts and subsidies are most needed, and also where price comparisons are more needed. OSI researchers will collect and input initial APC and discount/subsidy data over a period of six months, after which point publishers and discount/subsidy providers will be given instructions on how to keep their data current. This data from this system will feed into other systems we develop (see, for instance, the Yelp product).

- **OPEN IMPACT FACTOR + OPEN INDEXES:** Our uneven progress toward open is having unintended consequences. Among these consequences are the unavailability of legitimate impact factors for all journals (because not all journals are indexed), uncertainty about the number and growth of so-called deceptive/predatory journals (see deceptive/predatory study proposal), and the growing incidence of citations from non-indexed journals. Regarding this first problem, because the need exists for thousands of journals to get some sort of legitimate impact factor (whether this uses the same math as the current impact factor is a separate question—see the impact factor study, which will precede the development of this tool), because most journals will never earn a legitimate impact factor through Clarivate (since these journals don't pass rigorous tests for index inclusion), and because the alternatives (such as "global impact factor" or "universal impact factor") aren't legitimate, there is a need in the marketplace for new solutions

that are legitimate. OSI has discussed developing three possible solutions to these challenges: (1) Creating an open impact factor measure (described below), (2) creating an all-inclusive open index, and (3) creating an index of indexes. All three products/services have unique audiences and all three will be developed/piloted together. The first solution—the open impact factor—simply decouples Garfield's impact factor calculation from the private management and ownership of it by Clarivate—decoupling the algorithm from the data source so we can have as many lowercase "impact factors" with as many algorithms as we want. (Clarivate has trademarked "impact factor" and "journal impact factor" in the US but does not own the mathematical concept. This move is not wresting control of the impact factor away from Clarivate since the product they provide has substantial independent merit. Rather, it is simply providing legitimate alternatives to the "universal impact factor" and "global impact factor" for journals that do not qualify for a Clarivate-issued impact factor.) To do this will first require a developing a global index of journals, which is proposed solution number two. Current indexes are limited in scope and focus primarily on English-centered indexes. In order to improve the identification of deceptive journals it is necessary that we have a universal indexing system that overcomes the natural or operational exclusion of current indexes. Today such indexing is provided only by Google Scholar. Idea number three is to create an automated journal whitelist look-up, whereby a program will make an API call to a look up and return a list of whitelists on which a given journal appears (with cooperation from Cabell's, this call could also include blacklists). This system will return a finding like: "Journal X is indexed by WoS, JCR, Scopus, DOAJ, and MEDLINE." The lookup will also include subject lists (like EconLit, PsycINFO, MLA, and so forth) as well as regional titles. This system will be used to help dissuade citing non-indexed and possibly suspect work. Journals will be encouraged to adopt an editorial policy whereby if a referenced journal does not appear on a whitelist, then authors must justify the citation. This approach does not require much in the way of new infrastructure or the creation of new lists. It will, however, require various whitelist publishers to agree to allow such an API look-up (akin to Indeed or Monster scraping various job boards to provide one meta job board). The look-up would not contain any additional information from the white lists—only an indication of whether a journal appears on it.

- **APC PRICE COMPARISON TOOL**: As noted earlier, several recent studies have confirmed (Tenopir 2017) that scholars do not shop around for the best prices on APCs. And yet price shopping is behavior is assumed to exist and is fundamentally important to the success of the University of California's position with regard to cancelling access to Elsevier journals and hoping that alternative publishing options will not only take hold but save the system money (as enunciated by the UC's lead negotiator Jeff Mackie-Mason; see Mackie-Mason 2016), and also to the MPDL's OA2020 effort (which underpins the EU's Plan S initiative). APC price shopping may not exist yet simply because there is no tool to help facilitate this (to be clear, price is a factor, but surveys have shown that authors care more about quality and impact than price; the argument here is that if it was easier to compare prices, then maybe price would factor more in decisions). Although many in OSI are opposed to the carelessness of Plan S, we are not opposed to the idea of helping contain costs in publishing; developing an APC price comparator tool would therefore be of great service to the global scholarly communication community. No such tool currently exists. The development and deployment of this tool would need to proceed with care. While providing price information is valuable, we don't want to help promote fake journals either. Therefore, with help from Cabell's, DOAJ, SSP, and other relevant organizations in OSI, we will begin by creating a self-populating database of APCs from currently indexed journals only (seeded with initial data as available, at which point publishers will be emailed and instructed how to self-update information). Non-indexed journals with egregiously bad behavior (plagiarism, fake peer review, etc.) will not be listed in this database; non-indexed journals with smaller question marks (new, no street address, broad subject coverage, regional interest, etc.) may be listed with asterisks (indicating that authors should seek input from their library officials before publishing in it).

- **YELP SITE FOR SCHOLARLY PUBLISHING**: OSI will build a few tools that have wide "category-killer" appeal and real paradigm-shifting potential for scholarly communication. A Yelp site for publishers is one such tool (an All-Scholarship Repository is another). Both of these tools will have significant overlap with other tools we build and that exist on the market today—that is, they will incorporate some of the same data, but they will have broader audiences and fill more needs at once. The core purpose of the Yelp site for scholarly publishing is to provide an easy-to-use, familiar-looking interface where customers (authors, editors, reviewers, funders and more) can rate scholarly publishers (not just commercial journals but university presses, scholarly society journals and more) and where publishers can provide important contact and product information—a link to their website, a summary of their products and services, links and credentialing badges that verify data such as indexing and impact factors, and much more. Customers will be able to search this database for publishers in their field, price range, region and more—like the actual Yelp site, searches can be filtered in a wide variety of ways. Customers will also be able to provide reviews regarding their experiences with publishers, which will help round out the data provided by Cabell's blacklist and other information sources. For instance, customers might report that their peer review experience with a particular blacklisted publisher was perfectly acceptable, or conversely, that it was entirely inadequate with a highly-ranked publisher. The reviews that get posted on this website will take a few years to become accurate. At first they will be dominated by people who are either trying to mask bad products or punish good ones, but over time we suspect that this will become the go-to resource for all authors looking to publish their research and funders looking to identify reliable open access publishing options. As such, it will be heavily trafficked (at least relative to other products in the scholarly communication space) and a good revenue-generator. Ad revenue will help support the upkeep and sustainability of this product, with excess revenues accruing to OSI toward the development of OSI's other products (and studies); sponsorship support will also be important. This will be a complicated product to develop, launch and fine-tune, and very labor intensive as well. If we are able to begin product development in early 2020, it will take six months to work out the architecture, six more to populate with starter data, and six months after that to beta test and refine—a total of 18 months before the first iteration of this site is up and running. Due to its complexity, the vast majority of this product will be hired out—very little of the programming work will be conducted in-house.

- **ALL SCHOLARSHIP REPOSITORY:** The All-Scholarship Repository (ASR) is the ultimate game changer in scholarly communication. Rather than continuing to rely on (and expand) our global network of institutional and national repositories, and then exert herculean and ultimately inadequate efforts to connect the meta data in these repositories (which ends up only providing a glimpse into the contents of each repository, not full access to the contents themselves—at least at the moment), ASR jumps over this step and instead creates a single warehouse for all scholarly research content. The advantages of this global preprint server concept are multifaceted: full-text searches across all articles, the potential for widescale database standardization and integration, the potential for vastly expanded cross-discipline integration, the potential to implement widescale online peer review solutions, real-time and transparent impact measurement (via downloads, views, comments and reader scores), instant open for all content, and more. ASR, in essence, solves a hundred pressing issues in scholarly communication in one fell swoop. It's a leap, though, and will require widespread buy-in in order to succeed, including from publishers whose content is needed for this system. Where would publishers end up with this system? The same as now, publishers would identify the best and most promising research and publish these articles in their journals. They would also put their own interface on the ASR (a public resource) and curate contents as they see fit, adding value by analyzing trends, highlighting significant new discoveries in fields of interest, and more. The only difference would be that the preprint world would be "unshackled" from the print world, and would be free to grow at its own pace and direction. This may eventually mean fewer print journals and more reliance

on the ASR, but a possible decline in publisher subscription revenues would be offset by an increase in value added revenues. In terms of architecture, ASR would be single database with many spokes—many independent owner/operator channels through which data can be added and outputs can be customized. The Digital Public Library of America is the best example of how this system would operate. The central ASR database would be replicated and archived continuously; it would also be cloned by owner/operators. A fuller description of the ASR concept and operation is available in the appendix of OSI's February 2015 report (OSIWG 2015). The time frame for developing and launching ASR is longer than for our Yelp site since we will need about a year to discuss and arrange collaborations with major pre-print and government servers about data scraping and integration (we aren't expecting that ASR will replace any existing services until it is very populated, although the prospect of replacement will be promoted; US government agencies in particular, if directed by OSTP, might be keen to explore repository replacement instead of long-term and costly upkeep and modernization). If funding for ASR is secured by early 2020, our goal is to have an initial version of this repository running by end-2022. Like the Yelp site, this site will have revenue generating potential, but on a much more massive scale—not only advertising and sponsor revenue channels, but also percentage revenue arrangements with publishers who provide data for the site and resell data from the site. Excess revenues will be directed to OSI to ensure the continued full funding of OSI operations, in accord with the NSF's guidelines on this matter.

- **PREDATORY PUBLISHER BLACKLIST**: In collaboration with other organizations in this space OSI will create a free, publicly available list of the largest, most prolific predatory publishers. Curating and maintaining the full list is a labor-intensive endeavor and will remain a retail product of Cabell's, but the OSI list will serve as an initial "quick check" for potential authors, highlighting the most egregious and prolific predatory journals who account for the most of this kind of output and/or the most blatantly fake outputs (like OMICS). This site will also provide background information on predatory publishing, links to resources like Think-Check-Submit and Cabell's (for the full list of predatory publishers), and case studies on why this kind of publishing should be avoided (due to risks it poses to careers and science). There is no other resource like this on the market.

- **ITUNES SINGLE ARTICLE DOWNLOAD:** The idea of having an iTunes-type of tool for single-article downloads has been kicked around for years in publishing but never pursued. Various experts have dismissed it out-of-hand for various reasons, with criticisms like we shouldn't have to pay anything for these articles, and customers won't pay when they can find them for free with a little digging (interlibrary loans, etc.). These criticisms have never been tested though. Our hypothesis is that, in fact, creating a model where consumers can legally access the latest work (or close to it—maybe downloads from this system would be embargoed only briefly but not for as long as free articles) would be extremely well received by both publishers and the marketplace, creating new revenue pathways for publishers and cheaper access for customers. As with some of the other tech solutions we're proposing, this one may end up being a "module" of the ASR, so it will be developed with this in mind. That is, eventually the ASR may feature access to various categories of articles and products—free, cheap, PPV and subscription, for instance—and inasmuch, the architecture of this iTunes site should integrate seamlessly with the ASR. Ultimately, we view the iTunes site as a transitional tool—as a way to allow publishers to daylight a hundred years of backlisted articles now but in such a way as to still generate revenues from these assets. Careful modeling will need to take place first to determine price points, catalog, frontlist integration and more. Over time, as the ASR becomes richer and more populated, it may become more advantageous to de-monetize more and more of this backlist. Like the ASR and Yelp sites, the iTunes site will have significant revenues accruing from ads and sponsors. It will also accrue revenues from percentage sales. As with ASR, excess revenues from this site will be directed to OSI. Development and deployment will be on the same schedule as the ASR site, with full operation by end-2022.

EXISTING WORK/PRIORITIES

In addition to studies and tech products, OSI's existing work/priorities will also be supported by this grant. This includes:

- **CONSOLIDATION AND IMPLEMENTATION OF OSI RECOMMENDATIONS:** OSI has accumulated a wealth of knowledge over its four years of operation. We are in the early stages of publishing materials that consolidate this knowledge into issue briefs and policy perspectives. A few of these have been published to-date; many more are planned (around 50 have been identified), to be written by OSI participants. In terms of priorities, the next most needed publication is OSI's "Plan A" for open—a summary paper that captures the general sense of the OSI group with regard to what steps the global community should take next in order to ensure the rapid, collaborative and sustainable development of global open science. We expect this Plan A document to be issued by year-end 2019. Plan A will, in essence, be OSI's roadmap for the future of open science. A number of different stakeholder groups (including IGO's, led by UNESCO; scholarly societies, led by the NAS; the AAU, representing university provosts; and others) also realize that broad, collaborative action is needed now. What we are seeing as a result are parallel, high-level efforts happening around the world to create a new roadmap for the future of open. However, there is no convergence of activity and no central point. OSI will fill this role and communicate this convergence perspective in Plan A—as an observatory to keep these similar and important efforts connected, aware of each other's existence and activities, and coordinated so actions and policies can have more impact. We need this central hub to ensure that we can have reasonable, sustainable, global, inclusive action—a group to inform, coordinate and share policies that will lay the groundwork for the future of open research/data and open science in particular.

- **ANNUAL GLOBAL SURVEY OF STATE OF OPEN:** How is open changing? The fact is we just don't know. Studies measuring open aren't conducted at regular intervals and don't use the same methodology. In order to measure global progress toward open, we need a baseline and consistent, comprehensive, global measurements. Several OSI participants have volunteered to help develop this product and implement it. The Center for Open Science is once such partner; Editage/CATCUS is another (who will help translate this and disseminate it to global audiences). This annual survey will be an important tool in helping us better understand current needs and perspectives, understand where we need to focus our open efforts, and track our progress toward achieving our objectives.

- **EDUCATION/OUTREACH:**

    - One of OSI's goals is to help countries understand open and understand how this issue (and current global proposals) impacts their equity, education and development goals. Our issue briefs (which UNESCO has promised to help co-brand and promote) are one tool in our education arsenal. Our studies and tech products are other tools. In addition to these, we will improve/enrich the OSI website with the goal of making it more of a hub/resource for open and a more useful teaching tool.

    - There are many ways to learn about open, far fewer ways to collaborate on global actions to improve open that aren't biased toward set end-points (e.g., "let's do a global flip," or "let's remove publishers from the process"). There are a great many groups looking for constructive ways to engage in realistic measures. An important approach OSI will cultivate beginning in 2020 is to bring organizations together to help pick the low hanging fruit—to create a global environment of cooperation for solving the most urgent problems together and in doing so build a track record of success. We don't need a Plan S that changes everything for everyone tomorrow without regard for the consequences.

We do need a Plan A that describes what needs to be addressed and describes realistic and sustainable ways to begin tackling these issues together in ways that are easy and make sense for everyone, and importantly, that have incentives aligned such that partners will be joining in this effort out of self-interest and not due to threat or obligation.

- **EVENTS**: OSI has hosted two full-group meetings to-date (in 2016 and 2017), one executive team meeting (in 2018), and helped sponsor several other meetings in this space (such as SciELO-20 in 2018). We will need to hold and sponsor a number of other meetings in the coming years. There is no better way to get solid input from a diverse range of participants than to hold meetings. Email works okay to continue the conversation, but there is simply no substitute for breaking down walls and making progress than in-person meetings. OSI participants will also participate as speakers and panelists in other global meetings, communicating OSI's lessons of experience and also forging partnerships with universities, publishers, research institutions, governments, funders, societies and policy groups interested in moving forward with workable, global solutions to open research. By November of 2019, OSI will have marked four such efforts: (1) A presentation about OSI on the opening panel of the SciELO 20th Anniversary conference; (2) A presentation about OSI in the keynote portion of this year's Charleston conference, and (3) Inclusion of OSI and key OSI outputs (such as the DARTS open spectrum) in the 50th Anniversary addition of the STM Report, a key resource for the scholarly publishing community; and (4) Inclusion of OSI in a debate at the 2019 Falling Walls conference about the future direction of open science.

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Unpaywall (https://unpaywall.org/)

ANNEX 3:
OSI PARTICIPANTS, ALUMNI & OBSERVERS

The individuals invited to participate in OSI are mostly high-level leaders from scholarly communication stakeholder groups like commercial publishers, government policy organizations, research universities, libraries and library groups, non-university research institutions, and private and public funding agencies. The idea behind this VIP club is to shorten the telephone cord—to have direct conversations between decision makers in scholarly communication so the obstacles to reform can be overcome more easily. In all, about 450 leaders have participated in OSI in some capacity since 2015.

As a public and publicly-funded effort working on behalf of the international scholarly communication community, it is vital for us to be transparent about who is helping with this effort, but also to avoid the appearance that everyone who has participated in OSI at some point is currently engaged. The most accurate description of our work is that it has progressed in stages, with different experts contributing help and perspectives at different points. Over time, the observations and recommendations of OSI have evolved from and built upon this group effort more so than from the contributions of any one individual or institution.

In order for outside observers to better understand what the individuals in OSI have contributed over time, the table below identifies various types of engagement for each individual. Everyone on this list, to the best of our knowledge, has engaged in some capacity over the last five years, where engagement also includes "simply" remaining on the OSI list (which can mean reading an overwhelming volume of emails at times). Since 2015, 60 individuals out of these 450 invitees have been removed from the public version of this list because they neither engaged actively (via conferences, the listserv, etc.) nor appeared to be receiving OSI emails (although this may not be the case—some executive assistants have been assigned the task of monitoring this list, in which case these names have been removed in error; out of abundance of caution, however, since we aren't certain whether these individuals are still in OSI, we have removed their names from public view). An additional 18 individuals are not listed in the below table by request. Half are not listed because they have retired and wanted to reduce their email load; the other half are not listed due to conflicts of interest with their organizations or philosophical reasons.

It is important to also note the following about this list:

- Of the approximately 370 individuals listed below, not everyone engages regularly with OSI, or currently, or at the same time, or even at all, which is why we refer to this group as "participants, alumni and observers." In the past we've variously referred to the individuals who comprise OSI as members, delegates and participants, but this proved to be too imprecise. In an OSI survey (n=58) conducted in August 2017, approximately half of respondents preferred the term "participant" (compared to 29 percent who preferred "member" and 12 percent who preferred "delegate"). Internally, we refer to each other as "OSIers."

- All OSIers have been invited to participate in OSI with a clear description of what is being asked of them—an invitation to help OSI is not the same as an invitation to participate in a one-off conference. Some of these individuals have participated regularly since 2015, some just listen to the listserv and contribute on or off-list occasionally, and a few mostly just listen. All of these

individuals, however, have been willing to participate when called upon (for input, feedback, assistance, etc.), either publicly or privately, for which we are very grateful.

- Being included in this list does not necessarily indicate support (by the individuals or institutions listed) for OSI's specific positions or actions.
- There is no hierarchy within OSI whereby contributing to a paper is more important than attending a conference or contributing occasionally to listserv conversations. OSIers are volunteering their time, perspective, resources, influence and immense expertise to help improve the global future of scholarly communication. While we encourage everyone to participate, we are grateful for whatever contributions these individuals are able to make.
- On a related note, having no check marks by a name does not suggest an absence of activity. It may mean only occasional listserv participation, or occasionally replying to direct inquiries from the list. However, the individuals without check marks are indeed receiving OSI emails and in that sense they are still "active" observers in OSI.
- Finally, please note that titles and institutions change—individual titles and institutional affiliations were accurate at some point during each individual's active participation in OSI, but especially for currently active participants, these titles may now be out of date. In the case of some retirees, their titles may have changed from an institutional one to something like "former," "emeritus," "scholarly communication consultant" or "scholarly publishing consultant."

About 18 stakeholder groups, 27 countries and 250 institutions are represented by OSI participants, alumni and observers, many in an official capacity (for instance, library deans who have been asked by their chancellors to represent the interests of their university). The stakeholder distribution within OSIas of end-2019 (before reconciling this list down to 370-ish participants) is noted in the body of this report.

TABLE KEY

A = OSI 2016 delegate (193 total)
B = OSI 2017 delegate (113 total)
C = OSI2018 summit delegate (26 total)
D = 2014-18 steering committee member (12 total)
E = 2019-20 summit group participant (18 total)
F = Conference organizing volunteer (18 total)
G = Author, editor or reviewer of non-conference paper (28 total)
H = Other volunteer (outreach, sponsorships, committee service, etc.) (52 total)
I = Regular contributor to listserv conversations (27 total)

A	B	C	D	E	F	G	H	I	Participant name	Title
A							H		Aaron McCollough	Head, Scholarly Communication & Publishing, University of Illinois Library
A	B	C				G	H	I	Abel Packer	Co-founder and director, SciELO
A									Adam Huftalen	Senior Manager of Federal Government Affairs, RELX Group
	B								Adrian Ho	Director of Digital Scholarship, University of Kentucky Libraries
A									Adyam Ghebre	Director of Outreach, Authorea
A									Agathe Gebert	Open Access Repository Manager, GESIS Leibniz-Institute for Social Sciences
	B						H		Aimee Nixon	Head of Open Access Publishing, Emerald
									Alberto Pepe	Co-founder, Authorea

A	B	C	D	E	F	G	H	I	Participant name	Title
									Alex Kostyuk	Director, Virtus Global Center for Corporate Governance
							H		Alex Wade	Meta Data Platform, Chan Zuckerberg Initiative
									Alexander Garcia Castro	Senior Research Officer, Universidad Politécnica de Madrid
	B								Alexander Kohls	SCOAP3 Operation Manager, CERN
A	B				F				Ali Andalibi	Associate Dean of Research, Science, George Mason University
									Alice Meadows	Director of Community Engagement and Support, ORCID
									Alicia Fatima Gomez Sanchez	Scholarly Communication Consultant
A						G			Alicia Wise	Director, Information Power
A									Alison Mudditt	Director, University of California Press
A									Amy Brand	Director, MIT Press
	B								Amy Jessen-Marshall	Vice President Integrative Learning and the Global Commons, AACU
									Amy Koerber	Professor in Communication Studies and Associate Dean for Administration & Finance, Texas Tech
A									Amy Nurnberger	Research Data Manager, Columbia University
A	B						H		Andrew Tein	Vice President, International Government Partnerships, Wiley
A									Angela Cochran	Associate Publisher, American Society of Civil Engineers
A	B								Ann Gabriel	Vice President Global Academic & Research Relations, Elsevier
									Ann Michael	President, Delta Think
A									Ann Riley	President, ACRL
	B								Annie Johnson	Library Publishing and Scholarly Communications Specialist, Temple University
		C	D	E				I	Anthony Watkinson	Principal Consultant CIBER Research
A									Audrey McCulloch	Chief Executive, ALPSP
A	B								Barbara DeFelice	Program Director, Scholarly Communication, Copyright, and Publishing, Dartmouth
									Barbara Gordon	Executive Director, American Society for Biochemistry and Molecular Biology
	B								Barrett Matthews	Copyright & Scholarly Agreements Specialist, GWU
A									Becky Clark	Director of Publishing, Library of Congress
									Beth Staehle	Director pf Publications, Biophysical Society
A									Bev Acreman	Commercial Director, F1000
A	B	C				G	H		Bhanu Neupane	Program Manager, UNESCO
									Bill Hubbard	Deputy Head Of Scholarly Communications Support, JISC
A									Bobby Schnabel	CEO, Association of Computing Machinery
	B						H		Brad Fenwick	Senior Vice President, Elsevier
A									Brenda Johnson	Library Director and University Librarian, University of Chicago
A									Brett Bobley	CIO, National Endowment for the Humanities
	B								Brian Selzer	Assistant Director of Publications, American Public Health Association
	B								Brianna Schofield	Executive Director, Authors Alliance
A							H		Brooks Hanson	Director, Publications, AGU
A	B	C	D	E	F	G		I	Bryan Alexander	President, Bryan Alexander Consulting
									Bryan Vickery	Director, Cogent OA
									Carlos H. Brito Cruz	Science Director, Sao Paulo Research Foundation (FAPESP)
									Carol Mandel	Dean, Division of Libraries, New York University
A									Caroline Black	Associate Publishing Director, BioMed Central

A	B	C	D	E	F	G	H	I	Participant name	Title
	B						H		Caroline Sutton	Head of Open Scholarship Development, Taylor & Francis
A						G		I	Caroline Wagner	Chair in International Affairs, John Glenn School of Public Affairs, Ohio State U
	B								Carrie Calder	Director, Business Operations & Policy, Springer Nature
A									Catherine Murray-Rust	Dean of Libraries & Vice Provost for Academic Effectiveness, Georgia Tech
									Cathy Wojewodzki	Librarian & Scholarly Communication Officer, University of Delaware
A									Catriona MacCallum	Advocacy Director, PLOS
	B								Celeste Feather	Senior Director of Licensing and Strategic Partnerships, Lyrasis
									Charles Watkinson	Director, University of Michigan Press
A	B								Cheryl Ball	Director, Digital Publishing Institute, West Virginia University
									Chris Keene	Head of Library and Scholarly Futures, JISC
									Christie Aschwanden	Lead Science Writer, FiveThirtyEight
A									Christina Drummond	Data Trust Program Officer, Educopia Institute
									Christine Borgman	Distinguished Professor, UCLA
	B								Christine Stamison	Director, NorthEast Research Libraries Consortium (NERL)
A	B	C	D		F	G	H	I	Christopher Erdmann	Scholarly communication consultant
A									Christopher Thomas	Administrator, Defense Technical Information Center
									Claire Blin	Director of Libraries, University of Pierre and Marie Curie
									Claude Pirmez	Full researcher (formerly VP of Research), Fundação Oswaldo Cruz (Fiocruz)
A		C	D		F	G	H		Claudia Holland	Head, Scholarly Communication and Copyright, Mississippi State
	B	C							Colleen Campbell	Director, OA2020 Partner Development, Max Planck Digital Library
A									Colleen Cook	Dean of Libraries, McGill University
A	B								Concetta Seminara	Editorial Director, Social Science & Humanities Journals, Routledge/Taylor & Francis
A	B								Crispin Taylor	CEO, American Society of Plant Biologists
							H		Daisy Selematsela	Executive Director, Knowledge Management Corporate, National Research Foundation (South Africa)
									Dan Dunleavy	Post-doc researcher, behavioral health, Florida State University
	B								Dan Morgan	Digital Science Publisher, University of California Press
									Dan Nordquist	Deputy Vice President for Research, Washington State University
A						G		I	Danny Kingsley	Scholarly communication consultant
A					F				Dave McColgin	UX Director, Artefact
A	B						H		Dave Ross	Executive Director, Open Access, SAGE Publishing
									David Hansen	Director of Copyright & Scholarly Communications, Duke
	B	C				G	H		David Mellor	Project Manager, Journal and Funder Initiatives, Center for Open Science
							H	I	David Wojick	Government policy analyst
									Debra Kurtz	CEO, DuraSpace; now Asst Prof at ASU
A			D	E					Dee Magnoni	Research Library Director, Los Alamos National Lab
						G			Deni Auclair	CFO/Sr. Analyst at Delta Think
A	B								Denise Stephens	University Librarian, UC Santa Barbara
A									Diane Graves	Board member, EDUCAUSE; Assistant VP of Academic Affairs and University Librarian, Trinity University
	B								Diane Scott-Lichter	Sr. Vice President, Publishing, American College of Physicians; Chair, AAP/PSP Executive Committee
							H		Diane Sullenberger	Executive Editor, PNAS, National Academy of Sciences
A									Dick Wilder	Associate General Counsel, Gates Foundation

A	B	C	D	E	F	G	H	I	Participant name	Title
	B								Donald Guy	Manager, Research Collaboration & Library Services, Sandia National Labs
				E			H		Donald Samulack	President, Editage
A	B								Donna Scheeder	President, IFLA
									Elizabeth (Lizzie) Gadd	Research Policy Manager, Loughborough University
									Elizabeth Marincola	Former CEO, PLOS
A									Elizabteth Kirk	Associate Librarian for Information Resources, Dartmouth
A									Emily McElroy	Director, University of Nebraska Medical Center Library
	B								Emma Wilson	Director of Publishing, Royal Society of Chemistry
A	B					G	H		Eric Archambault	President and CEO, 1science
	B								Eric Brown	Division Leader, Explosive Science and Shock Physics, Los Alamos National Laboratory
A									Eric Massant	Senior Director, Government & Industry Affairs, RELX Group
A	B	C	D	E	F	G	H	I	Eric Olson	US Outreach Coordinator, ORCID
									Eva Stenskold	Research Manager, Riksbankens Jubileumsfond
									Fiona Murphy	open data expert
A									Frances Pinter	Founder, Knowledge Unlatched
A									Franciso Valdes Ugalde	Mexico Director, FLACSO
A									Frank Sander	Director of the Max Planck Digital Library, Max-Planck-Society, Germany
A									Gail McMillan	Director of Scholarly Communication, Virginia Tech Libraries
A									Gary Evoniuk	Director of Publication Practices, GSK
		C							Gemma Hersh	VP, Open Science, Elsevier
	B				F				Geneva Henry	Dean of Libraries and Academic Innovation, George Washington University
A									Geoff Bilder	Director of Strategic Initiatvies, Crossref
	B								Geraldine Clement-Stoneham	Knowledge and Information Manager, Medical Research Council, RCUK
A									Ginger Minkiewicz	Director, Smithsonian Scholarly Press
A	B	C							Glenorchy Campbell	Managing Director, BMJ North America
A									Grace Xiao	Co-Founder and President, Kynplex
A									Gregg Gordon	President, SSRN
									Gregory Eow	Associate Director for Collections, MIT
									H. Carton Rogers	Vice Provost for Libraries, University of Pennsylvania
A									Harriette Hemmasi	Dean of Libraries, Brown University
						G			Heather Piwowar	Co-founder of impactstory.org
A	B								Helena Asamoah-Hassan	Executive Director, African Library and Information Associations (AfLIA)
	B								Hillary Corbett	Director of Scholarly Communication & Digital Publishing, Northeastern University
	B								Holly Falk-Krzesinski	Vice President for Strategic Alliances in Global Academic Relations, Elsevier
							H		Howard Gadlin	Ombudsman, NIH
	B								Howard Ratner	Executive Director, CHORUS
									Idowu Adegbileiro-Iwari	Scholarly Communications Librarian, Elizade University (Kenya)
				E		G	H	I	Ilona Miko	Principal, mikoartscience
									Ingrid Parent	University Librarian, University of British Columbia

A	B	C	D	E	F	G	H	I	Participant name	Title
A									Ivan Oransky	Ivan Oransky, Vice President and Global Editorial Director, MedPage Today, and Co-Founder, Retraction Watch
A									Ivy Anderson	Director of Collections, California Digital Library
A								I	Jack Schultz	Director, Christopher Bond Life Sciences Center
A	B						H		Jake Orlowitz	Head of The Wikipedia Library, Wikimedia Foundation
A									James Butcher	Publishing Director, Nature Journals
A									James Duderstadt	Chair, Policy and Global Affairs Committee
A									James Hilton	University Librarian, Dean of Libraries, Vice provost for digital education and innovation, University of Michigan
									James Taylor	Deputy Executive Officer and Chief Operating Officer, American Physical Society
A									Jamie Vernon	Editor-in-Chief, American Scientist
									Jamie Witten	Head of Scholarly Communication, Indiana University Libraries
									Jamila Jaber	Central Libray Director, Islamic University of Lebanon
A									Jane McAuliffe	Jane McAuliffe, Director, National and International Outreach, Library of Congress
A									Jason Hoyt	CEO, PeerJ
									Jason Priem	Co-founder of impactstory.org
	B				F				Jason Schmitt	Associate Professor Communication & Media, Clarkson University
	B	C		E		G	H		Jason Steinhauer	Director, Lepage Center for History in the Public Interest, Villanova University
A									Jean-Gabriel Bankier	President and CEO, bePress
A								I	Jeff Mackie-Mason	University Librarian and Chief Digital Scholarship Officer, UC Berkeley
A									Jeff Murray	Deputy Director in Family Health, Bill & Melinda Gates Foundation
A									Jeff Tsao	Distinguished Member of Technical Staff, Sandia
A									Jennifer Howard	Former senior reporter, Chronicle of Higher Education
A									Jennifer Pesanelli	Deputy Executive Director of Operations and Director of Publication at FASEB
A									Jerry Sheehan	Assistant Director for Scientific Data and Information, White House Office of Science and Technology Policy (OSTP)
	B								Jessica Clemons	Associate University Librarian for Research Education and Outreach, SUNY-Buffalo
A									Jessica Sebeok	Associate Vice President for Policy, Association of American Universities
									Jie Xu	Associate Professor, Deputy Director of Publishing Study, School of Information Management, Wuhan University, China
A									Jill Mortali	Director, Office of Sponsored Projects, Dartmouth College
									Jill O'Neill	Director of Content, NISO
									Jo McShea	VP & Lead Analyst, STM, Outsell, Inc
A	B	C	D	E	F			I	Joann Delenick	Scientist, biocurator
								I	Joe Esposito	Senior Partner at Clarke & Esposito, LLC.
A	B							I	John Dove	Library and publishing consultant
A									John Inglis	Executive Director and Publisher, Cold Spring Harbor Laboratory Press and Co-Founder, bioRxiv
									John Paul Christy	Director of Public Programs, American Council of Learned Societies (ACLS)
A	B	C	D	E		G			John Warren	Head, Mason Publishing Group, George Mason University
A									John Willinsky	OA pioneer, PKP founder, and professor, Stanford U.
A				E			H		John Zenelis	Dean of Libraries and University Librarian, George Mason University
									Jon Cawthorne	Dean of Libraries, West Virginia University
						G	H	I	Jon Tennant	Rogue Palaeontologist

A	B	C	D	E	F	G	H	I	Participant name	Title
									Jonathan Crabtree	President, International Federation of Data Organizations (IFDO)
									Jose Roberto F. Arruda	Special Advisor to the Scientific Director, FAPESP
									Josh Brown	Scholarly publishing consultant
									Joshua Finnell	Head of Research, Colgate University
A							H		Joshua Greenberg	Program director, Sloan Foundation
A									Joshua Nicholson	CEO and Co-Founder, The Winnower
A									Joyce Backus	Associate Director, National Library of Medicine
A	B	C	D		F	G	H	I	Joyce Ogburn	Retired dean of libraries and professor
A									Judy Luther	President, Informed Strategies
A									Julie Hannaford	Deputy Chief Librarian, University of Toronto
A									Kaitlin Thaney	Director, Mozilla Science Lab
A	B								Kamran Naim	Lead Researcher, Open Access Cooperative Study, Stanford University; Strategic Development Manager, Annual Reviews
A									Karin Trainer	Former University Librarian, Princeton
									Karin Wulf	Executive Director, Omohundro Institute of Early American History and Culture, William & Mary
A									Karina Ansolabehere	Human rights and democracy expert
	B								Karla Cosgriff	Director of Advancement, Free the Science, The Electrochemical Society
A									Katherine Skinner	Executive Director, Educopia Institute
A									Kathleen Fitzpatrick	Associate Executive Director and Director of Scholarly Communication, Modern Language Association
A									Kathleen Keane	Director, Johns Hopkins University Press
									Kaveh Bazargan	Director, River Valley Technologies
A									Keith Webster	Dean of Libraries, Carnegie-Mellon University
	B								Keith Yamamoto	Vice Chancellor for Science Policy and Strategy, Vice Dean for Research, School of Medicine, and Professor of Cellular and Molecular Pharmacology, University of California San Francisco
									Kelly Johnson	Director, Stakeholder Outreach & Engagement, Waters Corporation
A									Kevin Bradley	President, US Journals, Taylor & Francis
A									Kevin Davies	Vice President for Business Development, American Chemical Society
A	B	C		E	F	G	H		Kim Barrett	Distinguished Professor of Medicine and Editor-in-Chief, The Journal of Physiology
									Kostas Repanas	Head, Office of Science Communication and Archives, A*STAR
	B								Kris Bishop	Product Manager, American Association for the Advancement of Science (AAAS)/Science Family of Journals
	B								Krista Cox	Director of Public Policy Initiatives, ARL
	B								Lacey Earle	Vice President of Business Development, Cabell's
	B								Lars Bjørnshauge	Founder and Managing Director, DOAJ
A									Laura Helmuth	2016 president, National Association of Science Writers
	B								Laure Haak	Executive Director, ORCID
A									Laurie Goodman	Editor in Chief, GigaScience
A									Lee Cheng Ean	University Librarian, National University of Singapore
	B								Leslie Reynolds	Senior Associate Dean of Libraries, University of Colorado Boulder
									Lia Zambetti	Assistant Head, Office of Science Communication and Archives, A*STAR
				E				I	Lisa Janicke Hinchliffe	Professor/Coordinator for Information Literacy Services and Instruction in the University Library at the University of Illinois at Urbana-Champaign

A	B	C	D	E	F	G	H	I	Participant name	Title
A									Lisa Macklin	Director, Scholarly Communications Office, Emory University
A									Lisa Spiro	Executive Director, Digital Scholarship Services, Rice University
									Loet Leydesdorff	Professor, Dynamics of Scientific Communication and Technological Innovation, University of Amsterdam
A	B								Lorcan Dempsey	Vice President of Membership & Research and Chief Strategist, OCLC
	B								Lorena Barba	Associate Professor of Mechanical and Aerospace Engineering, GWU
	B								Louise Page	Publisher, PLOS
									Lynn Kamerlin	Professor of Structural Biology, Uppsala University; Fellow of the Royal Society of Chemistry
									Manfredi M A La Manna	Reader, School of Economics and Finance, St Andrews
	B								Mangala Sharma	Program Director, Office of International Science and Engineering, National Science Foundation
	B	C		E		G		I	Margaret Winker	Secretary, World Association of Medical Editors
A	B								Marilyn Billings	Scholarly Communication & Special Initiatives Librarian, UMass Amherst
	B								Mark Newton	Director of Digital Scholarship, Columbia University Libraries
A									Mark Parsons	Secretary General, Research Data Alliance
A									Mark Ware	Director, Mark Ware Consulting
									Martin Hicks	Board member, Beilstein Institut
							H		Martin Jagerhord	CEO & Co-Founder, EduTrain GmbH
A	B								Martin Kalfatovic	Associate Director, Smithsonian Libraries
									Martin Sugden	Head of Open Access Marketing, Taylor & Francis
A									Mary Augusta Thomas	Deputy Director, Smithsonian Libraries
A									Mary Ellen Davis	Executive Director, American Library Association
A									Mary Woolley	President, Research!America
	B								Mary Yess	Deputy Executive Director & Chief Content Officer, The Electrochemical Society
A									Maryann Martone	Former Executive Director, Force 11
A									Matt Spitzer	Community Manager, Center for Open Science
A									Matthew Salter	Publisher, American Physical Society
									Maura Marx	Deputy Director for Library Services, Institute of Museum and Library Services (IMLS)
A									Medha Devare	Data and Knowledge Manager, Consultative Group on International Agricultural Research (CGIAR)
A									Meg Buzzi	Director, Project OPUS, UCLA
	B								Meg Oakley	Director of Copyright & Scholarly Communications, Georgetown
	B								Megan Wacha	Scholarly Communications Librarian, City University of New York
A		C	D	E	F	G	H	I	Mel DeSart	Head, Engineering Library and Head, Branch Libraries, University of Washington
A									Melanie Dolechek	Executive Director, Society for Scholarly Publishing
A									Melinda Kenneway	Executive Director, Kudos
A									Meredith Morovati	Executive Director, Dryad
A						G	H		Micah Vandegrift	Open Knowledge Librarian, NCSU
						G			Michael Clarke	Managing Partner, Clarke & Esposito
A	B								Michael Eisen	Co-Founder, PLOS and Professor of Genetics, Genomics and Development, U Cal Berkeley
	B								Michael Forster	Managing Director, IEEE Publications
									Michael Roy	Dean of the Library, Middlebury College

A	B	C	D	E	F	G	H	I	Participant name	Title
A									Michael Stebbins	Vice President of Science and Technology, John and Laura Arnold Foundation
A							H		Michael Van Woert	Executive Officer, National Science Board
A									Michael Wolfe	Executive Director, Authors Alliance
	B								Michael Zentner	Senior Research Scientist, Network for Computational Nanotechnology, Purdue
	B								Michele Woods	Director of the Copyright Law Division, World Intellectual Property Organization (WIPO)
	B								Michelle Gluck	Associate General Counsel, George Washington University
									Morgan Stoddard	Director of Research Services, George Washington University
									Moshe Pritsker	Co-founder, CEO, and Editor-in-Chief, JoVE
	B								Najko Jahn	Scholarly Communication Analyst, University of Gottingen
A	B	C			F				Nancy Davenport	University Librarian, American University
A	B								Nancy Gwinn	Director, Smithsonian Institution Libraries
									Nancy Kwangwa	Librarian, University of Zimbabwe
A									Nancy Rodnan	Senior Director, Publications American Society for Biochemistry and Molecular Biology
A	B								Nancy Weiss	General Counsel, US IMLS
A									Natalia Manola	Managing Director, OpenAIRE
A									Neil Jacobs	Head of Scholarly Communications Support, JISC
A									Neil Thakur	Special Assistant to the Deputy Director for Extramural Research
	B								Nick Lindsay	Journals Director, The MIT Press
A					F		H		Nina Collins	Scholarly Publishing Specialist, Purdue University
							H		Norbert Lossau	Vice-President, University of Göttingen
							H		Norma Roberts	Implementation Project Manager, Clarivate
A									Pablo Gentili	Brazil Director and member, Higher Council, CLACSO
A	B	C					H		Patrick Herron	Senior Research Scientist for Information Science + Studies, Duke University
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