



Extending the Principles and Promise of Scholarly Communication Reform: A Chronicle and Future Glimpse

By: Joyce L. Ogburn

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Interest in the functionality and components of scholarly communications has increased dramatically since the last decades of the 20th century. Many articles, books, reports, and declarations have appeared, some of which call for change and describe new functions and norms. Often, these documents espouse principles to guide and promote change. They may take the form of explicit statements, declarations, resolutions, directives, and policies. This chapter reviews representative and influential documents and describes the principles and goals on which change has been based. The review finds that the visions and principles for change have evolved, and in many cases have grown more ambitious and expansive. A look at early publications will set the stage and then principles will be examined by type of organization and will be analyzed and categorized. In some cases, principles have been quoted in their entirety and in others they have been abbreviated or condensed without changing their meaning for purposes of concision and inclusion. The chapter also explores questions and principles that might extend past trends and reflect recent developments. A discussion of the roles of librarians in the future of scholarly communication will conclude the chapter.ⁱ

Scholarly Communication and Principles

Principles are commonly used by individuals and organizations as a foundation and guidance for planning, action, and behavior. Principles may derive from the mission and values of an organization or from best practices, standards, and community norms and aspirations. They establish conditions and expectations, set priorities, help imagine the future, and may even be

seen as a call to action. In some cases principles may be viewed as fundamental and unimpeachable. Organizations and initiatives often announce their purpose and intentions by issuing a set of guiding principles, including them in their founding documents or in the introduction to reports or other documents. Principles may be embedded in purpose or vision statements, as well as appearing with goals and objectives.

The advent of principles for scholarly communication and publishing reform can be traced to the latter part of the 20th century. Not surprisingly, many statements and declarations are rooted in the value of openly accessible research and knowledge. Ideas developed in the early stages of reform are not always cast as principles. Instead, they explored how to address the perceived crisis of losing access to sustainable and affordable scholarship, and they drew attention to issues and spurred action. Further, the rapid growth of electronic capabilities heightened the awareness of systemic issues and opportunities for productive change.

The Andrew W. Mellon Foundation funded an important exploration in 1992: *University Libraries and Scholarly Communication*. The discussion of principles in this work was not extensive, but the opening synopsis states the goal to “propose and consider the issues raised by a better understanding of the past and present. It relates current concerns to the fundamental principles of scholarly communication and to the role of the research library in facilitating that communication.” While not defining these principles, the authors do touch on how changes in technology could influence scholarly communication by saying, “new electronic technologies allow the possibility of uncoupling ownership from access, the material object from its intellectual content. This possibility is revolutionary, perhaps dramatically so.”ⁱⁱ

The authors document the intellectual and technological shifts in the idea and physicality of scholarship and ownership. The implications are that the stewardship of intellectual content

was to become very different. As the study notes, “Such characteristics have led many observers to suggest that the process of scholarly communication can now be based on a principle of access rather than ownership.”ⁱⁱⁱ The authors’ couch their arguments in terms of library adaption to change, requiring collaboration, distributed resources, and sharing to achieve benefits like cost effectiveness and space saving. Finally, the authors reference Ann Okerson, who in 1990 offered principles of scholarly publishing that included “availability, affordability, and friendly access; the consequences of a shift from the current subsidization of the network to its eventual commercialization, intellectual standards... provoking fundamental reconsideration.”^{iv}

New visions for scholarly communication began to appear. Bailey, writing in 1994, reviews proposals for electronic publishing circulating at that time and concludes by outlining potential goals for a new system of publishing that read very much like principles. The goals envision an infrastructure for widespread dissemination, availability and use of research results. The goals speak to accessibility 24 hours a day every day, free exchange without censorship, distribution at lowest possible cost (or no cost), authors retaining copyright, the use of electronic information for noncommercial purposes, and maintaining user confidentiality.^v In 2003, Unsworth and Yu propose a vision of scholarly communication for 2010. “In a better world, high-quality, peer-reviewed information would be freely available soon after its creation; it would be digital by default, but optionally available in print for a price; it would be easy to find, and it would be available long after its creation, at a stable address, in a stable form.”^{vi}

Ten years later, one can see how far the principles have advanced. Van de Sompel et al. describe the process of scholarly communication as consisting of registration, certification, awareness, archiving, and rewarding. The authors suggest “a revised perspective on what constitutes a unit of communication in a future scholarly communication system.” The authors

propose principles that promote inclusion of “datasets, simulations, software, and dynamic knowledge representations as units of communication in their own right” and “complex documents that flexibly aggregate the products of the scholarly endeavor, regardless of their format or location.” More, the system of scholarly communication “must facilitate the early registration ...of all units in the system, regardless of their nature or stage of development. This would facilitate collaborative network-based endeavors and increase the speed of discovery. Preprints, raw datasets, prototype simulations, and the like should be afforded the ability to proceed through the scholarly value chain in the same manner that only journal publications are afforded in the current system.”^{vii}

This cluster of documents demonstrate the dynamics in ideas about scholarly communication, the view of traditional publishing at the time, and the incorporation of a larger scope of scholarly materials, such as data and software, as part of scholarship. The next section will describe how formal declarations developed.

Foundational Documents, Statements, Declarations and Resolutions

Most statements begin with the principle of *access*, and all others principles flow from that one simple word. As the era of formal declarations unfolded, four documents proved to be of significant influence; the Tempe Principles, the Budapest Open Access Initiative, Bethesda Statement on Open Access Publishing, and the Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities.

Principles for Emerging Systems of Scholarly Publishing, known as the Tempe Principles, was issued in 2000. This set of principles resulted from a meeting sponsored by the Association of American Universities, the Association of Research Libraries, and the University

of Kansas with the intent to “build consensus on a set of principles that could guide the transformation of the scholarly publishing system.” The participants tied “the creation, dissemination, and application of new knowledge” to “an informed citizenry and a healthy global economy.”^{viii} The document identifies nine principles that urge action to deal with current issues of scholarly publishing. Principles cover containing the cost of publishing, electronic capabilities, the permanence of scholarly publications, and the evaluation of the quality of publications. Other principles call for achieving a better balance of copyright for owners and users, negotiating faculty rights favorable to ready use, reducing the time from submission to publication, assuring that quality of publications rather than quantity guide faculty evaluations, and protecting the privacy of the users of scholarly works.

When the Tempe Principles were written open access was neither in common use nor defined, but that changed in 2002. The Association of Research Libraries expressed the opinion that, “The Budapest, Bethesda, and Berlin statements form the foundational base of statements on open access. Both free access and reuse rights are important components of open access.”^{ix} The Budapest Open Access Initiative (BOAI) stands as a particularly strong statement and established a foundation for principles to come. Written in 2002, it opens with this observation:

An old tradition and a new technology have converged to make possible an unprecedented public good. The old tradition is the willingness of scientists and scholars to publish the fruits of their research in scholarly journals without payment, for the sake of inquiry and knowledge. The new technology is the internet. The public good they make possible is the world-wide electronic distribution of the peer-reviewed journal literature and completely free and unrestricted access to it by all scientists, scholars, teachers, students, and other curious minds. Removing access barriers to this literature

will accelerate research, enrich education, share the learning of the rich with the poor and the poor with the rich, make this literature as useful as it can be, and lay the foundation for uniting humanity in a common intellectual conversation and quest for knowledge.

The BOAI also establishes the most widely used definition of open access.

By "open access" to this literature, we mean its free availability on the public internet, permitting any users to read, download, copy, distribute, print, search, or link to the full texts of these articles, crawl them for indexing, pass them as data to software, or use them for any other lawful purpose, without financial, legal, or technical barriers other than those inseparable from gaining access to the internet itself. The only constraint on reproduction and distribution, and the only role for copyright in this domain, should be to give authors control over the integrity of their work and the right to be properly acknowledged and cited.^x

The Budapest Open Access Initiative continues to be highly influential, and ten years after it began, additional recommendations were developed under the rubric of “set the default to open.” The recommendations set the direction for the next ten years to address institutional policies, licensing and reuse, infrastructure and sustainability, and advocacy and coordination.^{xi}

Another strong statement came shortly thereafter. The Bethesda Statement on Open Access Publishing, released in 2003, begins with recognition of how the Internet presented a new opportunity for sharing scientific research and could support fundamental change:

1. We encourage our faculty/grant recipients to publish their work according to the principles of the open access model, to maximize the access and benefit to scientists, scholars and the public throughout the world.
2. We realize that moving to open and free access, though probably decreasing total

costs, may displace some costs to the individual researcher through page charges, or to publishers through decreased revenues, and we pledge to help defray these costs. To this end we agree to help fund the necessary expenses of publication under the open access model of individual papers in peer-reviewed journals (subject to reasonable limits based on market conditions and services provided).

3. We reaffirm the principle that only the intrinsic merit of the work, and not the title of the journal in which a candidate's work is published, will be considered in appointments, promotions, merit awards or grants.
4. We will regard a record of open access publication as evidence of service to the community, in evaluation of applications for faculty appointments, promotions and grants.

We adopt these policies in the expectation that the publishers of scientific works share our desire to maximize public benefit from scientific knowledge and will view these new policies as they are intended—an opportunity to work together for the benefit of the scientific community and the public.^{xii}

The Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities, created in 2003, complements the Budapest and Bethesda documents. The intent of the declaration is “to promote the Internet as a functional instrument for a global scientific knowledge base and human reflection and to specify measures which research policy makers, research institutions, funding agencies, libraries, archives and museums need to consider.” This document declares that the tools used be available as well as the published results. “In order to realize the vision of a global and accessible representation of knowledge, the future Web has to be sustainable, interactive, and transparent. Content and software tools must be openly accessible

and compatible.”^{xiii} A conference continues to be held every year to assess the reform movement and plan future directions.

Statements, Declarations and Resolutions

Over time, the number of organizations adopting principles and expectations of the conduct and performance of scholarship and scholarly communication has increased. Many different organizations have adopted guiding principles - academic institutions, associations and not for profit organizations, publishers, non-governmental organizations, and governmental bodies. This section will delineate the principles adopted by many of these entities.

Academic Institutions

In many academic institutions, principles are the starting place for policy formulation. Peter Suber has been highly influential in the movement to create open access policies for academic institutions. Writing in 2008, he proposes this vision:

1. Universities should provide open access (OA) to their research output.
2. Universities should not limit the freedom of faculty to submit their work to the journals of their choice.
3. Universities now pay most of the costs of peer review, through subscription fees and faculty salaries. They should continue to bear the costs of peer review, in order to assure its survival, while recognizing that the forms and venues of peer review are changing.^{xiv}

Many universities have been mirroring Suber’s suggested principles in their policy statements. The policy at Harvard University, adopted by the faculty of the College of Arts and

Sciences in 2008, often serves as a model for other universities: “The Faculty of Arts and Sciences of Harvard University is committed to disseminating the fruits of its research and scholarship as widely as possible.”^{xv} Though not stated as a principle, the university is laying out the inspiration and intent of the policy. The University of Kansas is the first public institution to adopt an open access policy for its faculty and echoing Harvard’s policy, it states as its purpose: “Provide the broadest possible access to the journal literature authored by KU faculty.”^{xvi} Subsequently, many other universities adopted this language for their own policies.

It is important to note that policies of academic institutions, while seeking to open up research content, reinforce the value and principles of academic freedom, choice of publication venue, and peer review.

Associations and Not for Profit Organizations

In the opening years of the 21st century, professional associations also began to discuss, examine, and share their beliefs and principles in regard to scholarly communication. To show its commitment to change, in 2003 the Association of College and Research Libraries (ACRL) established “Principles and Strategies for the Reform of Scholarly Communication” that seek to attain broad and open access, control over publishing by the academy, reasonable pricing, innovation in publishing, and the importance of peer review. Other principles cover fair use of copyrighted information for education and research, the public domain, preservation of scholarly information for long-term future use and the right to privacy.^{xvii}

The International Federation of Library Associations (IFLA), a professional association, has taken up the cause of access to scholarly materials. In 2003, IFLA published the results of a meeting at The Hague that introduced new factors, incorporating the issues of censorship,

morality, and information equity. Written for “authors, editors, publishers, libraries and institutions, and advocates the adoption of the following open access principles in order to ensure the widest possible availability of scholarly literature and research documentation.” They introduce ideas such as the moral right of authors, opposition to censorship, overcoming information inequality for who may be disadvantaged in some way, and affordable access for the peoples of developing countries.^{xviii}

Six years later, the Association of American Universities, the Association of Research Libraries, the Coalition for Networked Information, and the National Association of State Universities and Land Grant Colleges (now the Association of Public and Land-grant Universities) jointly issued a publication entitled: “Principles and Practices for University Engagement in Disseminating the Work of its Faculty.” Prompted in part by the desire to codify the university’s role in publishing, they propose principles that recognize the importance of the dissemination of knowledge to the university, developing strategies for distribution, maintaining control of access to and use of faculty work outside the academy, and investing in infrastructure.^{xix}

The Scholarly Publishing and Academic Resources Coalition (SPARC), is one of the most active and vocal advocates for access to research, in particular government sponsored research results and data. It aims to be “an international alliance of academic and research libraries working to create a more open system of scholarly communication. SPARC believes that faster and wider sharing of the outputs of the scholarly research process increases the impact of research, fuels the advancement of knowledge, and increases the return on research investments.”^{xx}

The Alliance for Taxpayer Access, administered by SPARC, brings together “patient

groups, physicians, researchers, educational institutions, publishers, and health promotion organizations that support barrier-free access to taxpayer-funded research.” It is committed to four principles.

1. American taxpayers are entitled to open access on the Internet to the peer-reviewed scientific articles on research funded by the U.S. Government.
2. Widespread access to the information contained in these articles is an essential, inseparable component of our nation's investment in science.
3. This and other scientific information should be shared in cost-effective ways that take advantage of the Internet, stimulate further discovery and innovation, and advance the translation of this knowledge into public benefits.
4. Enhanced access to and expanded sharing of information will lead to usage by millions of scientists, professionals, and individuals, and will deliver an accelerated return on the taxpayers' investment.^{xxi}

The Coalition of Open Access Policy Institutions (COAPI) arose in 2011 specifically to “bring together representatives from North American universities with established faculty open access policies and those in the process of developing such policies. The coalition “strives to share experiences and best practices to foster the development and implementation of OA policies as well as to support, through SPARC, national and international advocacy efforts.” This organization operates as a means to share experiences and best practices to inspire, promote and implement open access policies at institutions without existing or effective open access policies.^{xxii}

In 2008, Science Commons, which was an independent organization but is now part of Creative Commons, issued its “Principles for Open Science.” Created at a meeting of the

Euroscience Open Forum in Barcelona, these principles include access to research tools that arise from funded research, the resulting data, and investment in cyberinfrastructure to support open science.^{xxiii}

Other groups have also used principles that reflect their foundational values and particular perspectives. For example, students are asserting their rights to access research through the Right to Research Coalition. Under the auspices of SPARC, this group supports students who asserted their rights and expectations that open access improves the educational experience, democratizes access to research, advances research, and improves the visibility and impact of scholarship.^{xxiv} The Author's Alliance was formed in 2014 to represent authors in issues such as copyright reform; preservation and protection of intellectual assets; access to cultural heritage; using global digital networks to share broadly; and finally: "to amplify the voices of authors and creators in all media who write and create not only for pay, but above all to make their discoveries, ideas, and creations accessible to the broadest possible audience." The Alliance proposes four principles regarding copyright law and the interests of creators, as well as those of the public.^{xxv}

Publishers

A group of not-for-profit publishers joined forces in 2004 to issue the *Washington DC Principles for Free Access to Science*. Their principles guide the mission to "maintain and enhance the independence, rigor, trust, and visibility that have established scholarly journals as reliable filters of information emanating from clinical and laboratory research," invest their revenue to support meetings, grants, and other activities, and to provide some form of free access, though much more limited than fully open access. Additional principles include: long

term preservation: development of tools that support the work of authors, reviewers, and editors; sharing of publication fees; acceptance of multiple types of publishing, along with working with other publishers to set standards for scholarly publishing.^{xxvi} These principles, combined with the practices identified, advocate for keeping control with the publishers in determining when and how research will be freely shared.

The Public Library of Science (PLOS) has a decidedly open approach to their publications and adheres to a clear set of principles for open access; excellence; scientific integrity; breadth; cooperation; financial fairness; community engagement; internationalism; and science as a public resource, which includes “building a public library of science includes not only providing unrestricted access to scientific research ideas and discoveries, but developing tools and materials to engage the interest and imagination of the public and helping nonscientists to understand and enjoy scientific discoveries and the scientific process.”^{xxvii}

In contrast, the IEEE uses a model that preserves the traditional role of publishers. They favor a balance between the value of open access and support for the many value-added services provided by publishers. Among their principles, they proclaim: “Open access can coexist with traditional publishing” and “Public access is best done on existing platforms of publishers” as well as “Any public access approach must respect the intellectual property rights of authors and publishers.”^{xxviii} These principles are complemented with a longer and more detailed list that addresses benefits to society globally, peer review, financial underpinnings, equal opportunities to publish, the role of government in funding and disseminating research, and intellectual property rights.

Nongovernmental Organizations, Foundations and Institutes

UNESCO has a long record of initiatives that make information more openly available in order to support an agenda devoted to sustainable development, human rights, open education, and universal literacy. The UNESCO open access policy statement of 1999 expresses their agenda this way: “Equal access to science is not only a social and ethical requirement for human development, but also essential for realizing the full potential of scientific communities worldwide and for orienting scientific progress towards meeting the needs of humankind.”^{xxix}

The Open Policy Network (OPN) aims to “foster the creation, adoption and implementation of open policies and practices that advance the public good by supporting open policy advocates, organizations and policy makers, connecting open policy opportunities with assistance, and sharing open policy information.” OPN takes a similar approach to others where their guiding principles begin with “The adoption of open policies can maximize the return on investment and promote a global commons of resources for innovative reuse.” Further, they express principles that support publicly funded resources being openly licensed.^{xxx}

The Global Research Council is a virtual organization composed of “the heads of science and engineering funding agencies from around the world, dedicated to promoting the sharing of data and best practices for high-quality collaboration among funding agencies worldwide.” To achieve the Council’s goals, they developed a set principles that covers their expectations for themselves as well as others to: receive a return on investment from their funding for journal articles, raising awareness of among their grantees and to education researchers about open access, and to encourage funders to support grantees in providing open access to their work.^{xxxi}

In 2013, Science Europe, an association of major European research funding organizations, established a vision and principles for open access publications to promote the

collective interest of its members and to foster collaboration between them. They stress the importance of publication and dissemination as essential components of research; see the value of publicly-funded research as a significant benefit to potential users; call for the re-use of information with few restrictions; and encourage development of a publication system that guarantees access to research publications without undue publication barriers; and commit the organization to transparency.^{xxxii} In 2015, Science Europe’s members modified their original principles by adding four that are specific to publisher services: indexing, transparency of technical information and peer review, copyright and reuse, and sustainable archiving.^{xxxiii}

In each of these cases, the commitment to open access, as expressed in a set of principles, reflects the particular agency’s focus on various aspects of economic development and/or social welfare.

The year 2015 also saw the emergence of goals and principles from a new group formed to address open science – The National Science Communication Institute. In the document the organization issued, four of the contributors express different but complementary principles for scholarly publishing. One author offers, for example, that an ideal scholarly publishing system is “widely accessible, filters the flood of information, and has indicators of quality.” The report lists twenty-two other principles that cover a wide terrain, some of which are: persistence of information; dealing with spurious, incorrect or false claims; review and certification; an open process of assessment; creative reuse and repurposing of research material; and routes for more inclusive and participatory scholarship.^{xxxiv}

Foundations and other funding bodies are issuing their own principles for the dissemination of research they support. The open access policy of Wellcome Trust emphasizes support for “unrestricted access to the published output of research as a fundamental part of its

charitable mission and a public benefit to be encouraged wherever possible.” Their stated mission is “to support the brightest minds in biomedical research and the medical humanities.” In pursuit of this mission and with belief that “online access is the most effective way of ensuring that the research we fund can be accessed, read and built upon,” the Trust established expectations for where researchers would publish and to maximize the distribution through open access.^{xxxv}

The Wellcome Trust enacts their goals through a set of expectations and requirements that include: free access; availability through PubMed Central and Europe PubMed Central as soon as possible or within six months of publication; select publishing routes that ensure the work is available immediately on publication in its final published form; willingness to cover open access charges; licensing for research papers using the Creative Commons Attribution license; and an affirmation that the intrinsic merit of the work that should be considered in making funding decisions.

Other funding agencies and organizations have similar principles and requirements. For example, the Ford Foundation states its intent to “make their research widely accessible.”^{xxxvi} The Bill and Melinda Gates Foundation adopted principles that will go fully into effect in 2017 that include: publications are discoverable and accessible online; all publications shall be published under the Creative Commons Attribution 4.0 Generic License (CC BY 4.0) or an equivalent license; the foundation will pay necessary fees; publications will be accessible and open immediately; and data underlying published research results will be accessible and open immediately.”^{xxxvii}

Governmental Bodies

Many national governments are developing principles, policies and practices to guide the sharing and preservation of their research and cultural heritage. The United States government has been among the leaders in making public access to government-funded research more accessible, usable, and reusable. In response to the efforts of various groups to open up federally-funded research, in 2007, the National Institutes of Health (NIH) Public Access Act launched the taxpayer rights argument, predicated on the principle that taxpayers should have access to the fruits of their investments in research.^{xxxviii}

Advocacy for such public access has gained momentum and in 2009, a Publishing Roundtable was convened to advise the Committee on Science and Technology of the House of Representatives and the White House Office of Science and Technology Policy (OSTP). To guide policy development, the Roundtable identified a set of principles “shared across the range of member perspectives, which should continue to inhere in scholarly publishing as it evolves.” As a foundation for federal agencies to build on, the directive provides the following fundamental principles:

1. Peer review must continue its critical role in maintaining high quality and editorial integrity.
2. Adaptable business models will be necessary to sustain the enterprise in an evolving landscape.
3. Scholarly and scientific publications can and should be more broadly accessible with improved functionality to a wider public and the research community.
4. Sustained archiving and preservation are essential complements to reliable publishing methods.

5. The results of research need to be published and maintained in ways that maximize the possibilities for creative reuse and interoperation among sites that host them.^{xxxix}

Informed by this report, the White House, via OSTP, issued a directive to guide government agencies in developing policies and procedures for implementing public access to federally funded research. The directive states, “Scientific research supported by the Federal Government catalyzes innovative breakthroughs that drive our economy. The results of that research become the grist for new insights and are assets for progress in areas such as health, energy, the environment, agriculture, and national security.” The directive further calls for “the direct results of federally funded scientific research to be made available to and useful for the public, industry, and the scientific community.” The principles of the directive address peer-reviewed publications, data in all formats, and valuing the role of publishers in dissemination of scholarly publications. The OSTP policy charges Federal agencies to create “clear and coordinated policies for increasing such access.”^{xl}

Not all federal agencies have developed guiding principles as part of their response to the directive. The National Aeronautics and Space Administration (NASA) is one that has. This agency’s principles recognize the importance of data management; sharing data for validation of research results and increasing the value of data to society and across disciplines; protection where needed to acknowledge confidentiality and intellectual property rights; and pledge to support privacy.^{xli} NOAA, the National Oceanic and Atmospheric Agency developed somewhat different principles: publications being made publicly accessible in a timely fashion; if necessary, an embargo period of no more than 12 months; minimizing additional paperwork and requirements; and leveraging existing activities, systems, and approaches.^{xlii} The National Science Foundation created these principles to guide their planning process:

- Implement a flexible, incremental, integrated approach to data and publications that can be extended to other products (for example, white papers, technical report, and so on);
- Minimize burden to awardee institutions, Principle Investigators and NSF staff; and
- Collaborate with other agencies and public/private organizations to minimize cost and burden.^{xliii}

Efforts to promote access to government-funded research are international. In Canada, for instance, principles have been guiding national practices since 1997, beginning with the statement that: “Scholarly communication is a process, not a product, and publications are an integral part of that process. Given current economic and technological conditions, we have the opportunity to rethink scholarly communication. Such a rethinking should conceive of research as a network of activities, rather than a linear pipeline.” The principles articulated in this document grew to constitute the foundation for additional work in Canada. Note that well before other countries, Canada called for publicly funded research to be “publicly accessible beyond the research community, both to individuals and to non-research-oriented institutions.”^{xliv}

The Finch Report, issued in 2012, established principles for the UK. The report recommends “that the UK should embrace the transition to open access, and accelerate the process in a measured way which promotes innovation but also what is most valuable in the research communications ecosystem.” The principles revolving around access, usability, quality, and cost and sustainability form the core of the report and actions to come.^{xlv}

Moral Obligation, Public Good, Social Justice, and Sustainable Development

In recent years, awareness and commitment to change have produced questions about the value of scholarly research to a broad, and often global, community. Principles are being driven by questions such as: What is good for the public at large? Is open access truly a global concern? How can the open dissemination of research foster social justice and sustainable development? These questions are now gaining traction within the open access movement.

The Glasgow Declaration on Libraries, Information Services and Intellectual Freedom (2002) arose from a meeting of IFLA that marked the 75th anniversary of founding the association. The declaration codifies new expectations and principles to inform the role of libraries in upholding human rights and intellectual freedom. The first proclamation states that “the fundamental right of human beings both to access and to express information without restriction,” and goes on to say, “This intellectual freedom encompasses the wealth of human knowledge, opinion, creative thought and intellectual activity. IFLA asserts that a commitment to intellectual freedom is a core responsibility of the library and information profession worldwide, expressed through codes of ethics and demonstrated through practice.” Their affirmations that address the role of libraries can be summarized this way:

- Offering essential support for independent decision-making, cultural development, research and lifelong learning by both individuals and groups;
- Safeguarding democratic values and universal civil rights and opposing censorship;
- Acquiring, preserving and making available the widest variety of materials, reflecting the plurality and diversity of society irrespective of political, moral and religious views.
- Making materials, facilities and services equally accessible to all users.

- Protecting each user's right to privacy and confidentiality with respect to information sought or received and resources consulted, borrowed, acquired or transmitted.

IFLA charges libraries and information services to uphold and promote the principles of intellectual freedom and to provide uninhibited access to information.^{xlvi}

The Lyon Declaration was informed by the Glasgow Declaration. Issued in 2014, it casts access to information as a means to achieve sustainable development and touches on the relationship between openly available information, sustainable development, and the obligations of libraries. The signatories affirm the crucial role of access to information and agree that:

“Equitable access to information, freedom of expression, freedom of association and assembly, and privacy are promoted, protected and respected as being central to an individual’s independence. Increased access to information and knowledge, underpinned by universal literacy, is an essential pillar of sustainable development. Greater availability of quality information and data and the involvement of communities in its creation will provide a fuller, more transparent allocation of resources. Information intermediaries such as libraries, archives, civil society organisations (CSOs), community leaders and the media have the skills and resources to help governments, institutions and individuals communicate, organize, structure and understand data that is critical to development.”^{xlvi}

The Lyon Declaration contains more principles and commitments that don’t relate to issues of access to information, but it does call for actions that acknowledge the importance of access to information, together with the skills required for effective use of information.

Data

The subject of access to data may seem like a recent phenomenon, but principles governing data arose as early as 1996, coinciding with the rush to sequence the human genome. The Bermuda Principles were developed at the First International Strategy Meeting on Human Genome Sequencing. Participants included came from many quarters, including the Wellcome Trust, the U.K. Medical Research Council, the NIH National Center for Human Genome Research, the U.S. Department of Energy, the German Human Genome Programme, the European Commission, the Human Genome Organisation, and the Human Genome Project of Japan. A summary of the principles is offered: primary genomic sequence should be in the public domain; primary genomic sequence should be rapidly released; and coordination of activities should occur for both research and genomic sequencing.^{xlviii}

Since 1996 efforts intensified to provide access to and management of data. The value of data to ongoing research, scholarship and application began producing new principles. In 2007, the Organization for Economic Co-operation and Development (OECD), an international body that provides a forum for members to address challenges of globalization, issued *Principles and Guidelines for Access to Research Data from Public Funding*. The document contains thirteen principled elements of openness that should apply to “research data that are gathered using public funds for the purposes of producing publicly accessible knowledge.” The elements they developed include: flexibility; transparency; legal conformity; protection of intellectual property; formal responsibility; professionalism; interoperability; quality; security; efficiency; accountability; and sustainability.^{xlix}

The Panton Principles were produced in 2010 to address practices for open data. The document states that, “science is based on building on, reusing and openly criticising the

published body of scientific knowledge. For science to effectively function, and for society to reap the full benefits from scientific endeavours, it is crucial that science data be made open.”

The authors continue with an explanation of what open data is, and how it can be used. They argue that, “data related to published science should be explicitly placed in the public domain.”

These principles express and expose the complexity of managing, licensing, and sharing data along with expectations to be met. An abbreviated version encompasses the following elements:

1. Where data or collections of data are published it is critical that they be published with a clear and explicit statement of the wishes and expectations of the publishers with respect to re-use and re-purposing of individual data elements, the whole data collection, and subsets of the collection.
2. Many widely recognized licenses are not intended for, and are not appropriate for, data or collections of data. A variety of waivers and licenses are designed for and appropriate for the treatment of data.
3. The use of licenses which limit commercial re-use or limit the production of derivative works by excluding use for particular purposes or by specific persons or organizations is **STRONGLY** discouraged. These licenses make it impossible to effectively integrate and re-purpose datasets and prevent commercial activities that could be used to support data preservation.
4. Furthermore, in science it is **STRONGLY** recommended that data, especially where publicly funded, be explicitly placed in the public domain. This is in keeping with the public funding of much scientific research and the general ethos of sharing and re-use within the scientific community.¹

Research Council UK created principles in 2011 and re-issued its report in 2015. The report's view is that "making research data available to users is a core part of the Research Councils' remit and is undertaken in a variety of ways." The Council proposes to use principles to guide their policies on data, beginning with this statement: "Publicly funded research data are a public good, produced in the public interest, which should be made openly available with as few restrictions as possible in a timely and responsible manner." The principles deal with data management and preservation; discoverability and re-use; legal, ethical and commercial constraints on release of research data; a limited time of privileged use of the producers of the data; indicating the source and conditions imposed on data; and the effective use of public funds.^{li}

The Royal Society in Great Britain issued a report on *Openness in Science* in 2012 that focuses on data. The report offers a series of recommendations that lay out key principles to guide other agencies and organizations in the use of data. The phrase "intelligent openness," is used as a basis for their principles and is described this way:

Mere disclosure of data has little value per se. Realising the benefits of open data requires a more *intelligent openness*, one where data are effectively communicated. For this, data must fulfill four fundamental requirements, something not always achieved by generic metadata. They must be accessible, intelligible, assessable and usable.^{lii}

The report identifies ten recommendations as guiding principles that include: communicating with a wide audience, recognizing data communication as something to be rewarded; learned societies, academies and professional organizations adopting models of open access; journals requiring that the data be accessible, assessable, usable and traceable through information in the article, and more.

The G8 issued the *Open Data Charter* in 2014. The principles listed are succinct - open data by default; quality and quantity; useable by all; releasing data for improved governance; and releasing data for innovation – and are accompanied by extensive explanations. A technical annex accompanies and amplifies this set of principles.^{liii}

In addition to the OSTP policy that applies to research results such as articles and data in electronic form, this office issued a policy for the collection and preservation of scientific collections, which in turn, as physical artifacts and data, can support additional research. This policy outlines principles that evoke those for other data types, and recognizes the value of collections as “tools that can be harnessed to address challenges facing humankind. Federally supported scientific collections are public assets, and their stewardship by Federal agencies carries with it trustee responsibilities.” The directive points to the need for policies and procedures regarding the care and management of these collections, as well as their ethical use, noting their intrinsic value as “the Nation’s legacy of exploration and discovery.”^{liv}

Writing in 2008, Wilbanks offers three organizing principles for data regimes: legal predictability and certainty, ease of use and understanding, and low costs to users.^{lv} More recently, FORCE 11 created data citation principles that address the practical issues of “purpose, function and attributes of citations. These principles recognize the dual necessity of creating citation practices that are both human understandable and machine-actionable.” The FORCE 11 principles are: importance; credit and attribution; evidence; identification; access; specificity and verifiability; and interoperability and flexibility.^{lvi}

The American Psychological Association (APA) published a document in 2015 to address the principles of sharing data in the social sciences, with the objective to:

- Promote scientific progress

- Encourage a culture of openness and accountability in scientific research
- Allow geographically dispersed individuals and those with limited resources to investigate scientific questions of interest, enable replication of analyses for verifying empirical findings, and open extant data to analysis with new, more powerful, or integrative techniques than were available at the time of collection
- And promote aggregation for the purposes of knowledge synthesis, hypothesis generation, programmatic decision-making, and generalizability.^{lvii}

These principles of the APA are amplified by ten considerations that include such areas as rights, access terms, standards, costs, and training.

Exclusions from Open Access

As open access has advanced, the reform movement has exposed cultural, legal, and other challenges to making research results and data openly available and reusable. Some information may never be openly available due to issues of privacy, contracts, agreements, nondisclosures, national security, or other legal constraints. Take, for instance, the complexities presented by native or indigenous culture, identity, and knowledge. The principles, values, and tenets of different peoples and cultures affect decisions about what should be open and on what terms. Different perspectives and beliefs underpin concepts of knowledge, as well as what access should be provided to knowledge and the ownership thereof. Ownership and control of rights may not be easy to determine, thus barring information from being openly accessed and shared.

The OSTP directive on scientific collections recognizes cases when access may be restricted, where it may be legitimate to “limit access to collections and information about collections for the purpose of protecting national interests including honoring copyright, international or tribal agreement, confidentiality, privacy and other laws, and regulations, or

addressing security concerns.” Examples include the protection of endangered species or archaeological sites, complying with the Native American Graves Protection and Repatriation Act, and adhering to other similar protective measures.^{lviii}

Key Concepts and Their Extensions

This chapter has related a wide array of principles that can be organized into common themes and concepts. This section is organized by theme and also poses questions that incorporate recent developments in thinking, policy, technology, and more.

Access. Access, as the primary principle, forms a basis for other principles, with equitable, widespread and open access at the core. With open access one doesn’t have to predetermine the community that may have interest in or benefit from using scholarly material. The audience and the stakeholders include patients, taxpayers, professional associations and societies, independent scholars, policy and decision makers, and a worldwide audience of users without the means to gain access. The global audience is associated with researchers, medical personnel, emerging democracies, and more. Access principles have come to include the rights of taxpayers to have access to the research they fund, referred to as “public access.” Patient advocates, in particular, have advocated for access to information published in the health sciences. Increasingly, principles of public access apply to associated data in electronic and tangible form. There are many products that are openly available for reading and downloading; however, many still retain copyright restrictions and cannot be reused. More are applying a Creative Commons license, not all of which grant uninhibited use. There are often both legal and technological barriers to access and reuse. How should works be treated that are not entirely open because a portion of the content cannot be shared openly, such as images or graphics? One

might be challenged to establish an account to obtain free access, but this access should not be a “teaser” that allows the entity to collect data about the user. Do we know how our shared information is being used when we sign in to our accounts?

Scope. At first, principles focused on the published work, primarily the article. A trend that is gathering strength is the expansion of the definition of scholarship and the scholarly record to include all products, processes, systems, software, and associated contextual information. Emerging ideas on scholarship and scholarly contributions are challenging conventions. As scholarship changes, what counts for promotion and tenure is being challenged to accept different forms and measures. Gray literature like reports and white papers have not been a part of the formal publication stream, and they are easily overlooked. How should we value and provide principles for these creative works? How will innovative and experimental forms of scholarship be assessed, accepted and valued? Must they conform to open access principles and policies? What about the desirability of publishing negative results – what principles should apply in this case?

Evidence. As noted above, various forms of evidence underlying research are being included in the expectations for discovery, access, and preservation. Should all scientific collections be preserved and linked to associated research and other data? In rhetoric about data often the assumption is that “data” will be in a form that one can analyze and process electronically. Should artifacts be rendered digitally to facilitate access and analysis? What other principles do we need to encompass all of the associated evidence, data, workflow, images, analysis, and tools? Perhaps the requirement that these should be open and linked to the research results?

Economics. The economic and financial aspects of publishing have long been a source of contention. Issues are often couched in terms of cost containment, affordability, and economic benefits that can accrue from spurring competition and innovation. Economics has shifted toward the intrinsic value of being openly accessible, achieving a return on investment by taxpayers, the importance of leveraging federally funded or foundation sponsored research, and making open access a condition of funding. The question of who pays for the dissemination of scholarship, along with how or when, continues to be debated. Payment may occur at many different points in the process and include subscriptions, page charges, open access author fees, and article delivery. Should we break down the components of the system and ask the question of who pays for each one or is there one all-encompassing principle that can apply to all situations? Guidelines have been developed to address citation, data transparency, analytic methods, research materials transparency, design and analysis, preregistration of studies, preregistration of analysis plans, and replication.^{lix} The source of funding for research is now an element that has been called into question as a possible source of bias.^{lx}

Legal and policy frameworks. The legal environment is becoming more complex, due in part to the capabilities of technology, software and algorithms. Policy issues consist of a wide array of elements: the tensions between copyright and fair use; ethical behavior; the rights of the author; user rights to privacy; the content of the public domain; and governmental policy and mandates. Other aspects of research results include proprietary methods or results that are governed by nondisclosure agreements and may never enter the public sphere for discovery. These could include patented methods, reports, experimental results - positive and negative - and more. In the principles of some organizations, they have gone so far as to require the use of licenses like those offered by Creative Commons. All of these issues have transnational

implications and require broad engagement of many organizations to translate the issues and principles into practical and appropriate outcomes. Some principles advocate remaining with traditional models that provide comfort in their familiarity and relative ease application in formal academic evaluative practices. As accepted definitions of scholarship evolve to be more inclusive of a wider variety of research activities and products, there will be many that are open by design and others that will have legal implications. How important is compliance with directives? Who will monitor compliance and what will be the consequences of noncompliance?

Technology. Early documents point to the convergence of rising prices, new technology, the Internet, and research demands as a key element driving change. They speak of the promise of technology to expose and promote new scholarship. Many other goals and principles followed as technology improved, such as improving interoperability and building trusted repositories. The expectations for technology remain ambitious. Can we achieve equitable and ready access to large-scale storage and robust computing resources? Should there be principles to address whether the associated software and repository software must be viable, open source or openly available to facilitate replication and verification? Are there concerns about when the format of information is proprietary and may in time become unreadable, unsupported, or obsolete? Will the standards for open access grow to include interoperability across all platforms, repositories, and archives that house scholarly products? Large-scale computation, algorithms, search engines, and artificial intelligence have the potential for harm or discrimination; how should we address this issue? Should we require the source to be made explicit for the documents written by computers without human intervention? In the future, we can expect to see more machine mediation between people and the information they seek, raising the issue of being open about the algorithms that are employed. Search strategies and terms may be tracked in exchange for

free access with an account – do we maintain anonymity in these cases? This may be one of the more pressing concerns to address with new principles.

Context. Principles haven't explicitly addressed how much context should be carried with all parts of the information "package" to ensure access, consistency and reliability for years to come. Context can include a host of information; whether an article was ever embargoed, for example, or if its open status has changed to closed while an open version remains available somewhere. Will we always know whether the source of publication employed peer review? That the article was made open by payment to the publisher to ensure that access is not later closed? How might the lack of context going forward hinder the future use of scholarly and research information? How important might the history, changes in status or other contextual information be to trust and verifiability for research? What if research has been deemed fraudulent, discredited, censured, offensive, retracted, or withdrawn from the scholarly record? Should the grant proposal and subsequent reports be made openly available?

Community. Through open access we can expose previously privileged information to the growth of existing and new communities of practice, which may benefit multiple parties. How do we define community in a society where people have many different roles and engage with a number of communities? How do we determine community norms? In the academic community principles that touch on copyright, fair use, academic freedom, and peer review are prevalent. These principles represent and reinforce existing community values, ethics, practices, and philosophy. The aim remains to preserve fundamental elements such as intellectual and academic freedom and peer review, but with a renewed emphasis on responsible conduct, proper credit and attribution, replication, and verification of research. New concepts have emerged in regard to developing infrastructure, non-competitiveness, return on investment, and research

integrity. How will these universal principles be applied in different communities? How does community relate to the public good and public interest?

Identity. Closely related to community is identity. Do we need principles to address and support the various identities and roles people assume throughout their lives? How are we affected as each of us moves between various roles? At different times or stages in our careers we may be author, reviewer, publisher, creator, or consumer and our lives are governed by our different identities and identifiers. How can principles guide us as people become someone else's statistic, data point, or research subject? What accountability is required? We are urged to manage our professional profile in social media, as researchers recognized by services such as ORCID, and as contributors to other scholarly work. Should one be given the choice to opt out of registers or lists of identifiers? Citizen science is bringing renewed energy to identifying, collecting, analyzing, and describing data. How are these scientific contributors being recognized?

Timing. The theme of time includes embargo periods, time to publication, and the appropriate time to share research results or data and with whom. The dimension of time has been a contentious issue in policy discussions, in particular in regard to federally funded research. The locus of authority for making decisions about these issues has been a source of tension as well. Should the authority be left to the creator, publisher, institution, or grantor? Should data and other evidence be released the same time as the publication?

Global Reach. Global applications and implications relate to reaching and encouraging a global community of users. Many creators take quite seriously the charge to share as widely as possible and to accelerate the diffusion of knowledge to all who are interested. Principles appeal to global issues such as social justice, sustainable development, the public good, and the public

interest. Access to scholarship is now being considered as a fundamental human right. There is growing attentiveness to indigenous knowledge and cultural property and rights, which may include moral obligations and have global implications. As the world grapples with extending information access to everyone without regard to privilege and status, there will be more attention paid to issues of universal literacy, global citizenship, the digital divide, and building healthy communities. How are these governed or solved by access to information, now and into the future? Open access creates more opportunities for lifelong learning, social movements, and public discourse that are not limited to the western hemisphere and highly developed countries. How do we make it easy for these opportunities to arise?

Readability. As we talk about access, do we need to consider multiple kinds of accessibility, such as readability and the quality of the writing? Is an article really accessible if it is poorly written, convoluted, and inaccessible to others outside of the field because of the complexity of the language and use of jargon? How should we treat information that is not equally accessible to humans and computers? How do we guard against the misuse of information is readable only by machines? How do we ensure the integrity of information as it moves between humans and machines multiple times?

Discovery. Many statements of principles ask for easy discoverability and access. Is discovery dependent upon having all parts of a scholarly endeavor preserved together in the same repository? Should our indexes, guides, and other finding aids be maintained and updated to incorporate the latest descriptive methods and standards? What happens when open links change or go away? Do we always know why we are granted or denied access? Many organizations that require that the projects they sponsor be openly available but fail to apply these principles to their internal documents. For example, federal agencies have a mandated policy for grant-funded

research, but not for their internal research. We lack a principle that establishes the expectation that institutions commit to open access for internal documents that may be of value to others. Preservation and potential discovery is at risk from individual and institutional practices that don't recognize either the immediate or long-term value of access to this information.

Standards. NISO is promulgating standards to facilitate openness of information and to address some of the metadata requirements for implementing best practices.^{lxi} A host of questions still remain. For example, should a document include metadata that it is entirely open access and have this status maintained wherever the document goes and however it is used? As articles become disassociated from the journal in repositories or by other means, should we include metadata indicating the work was peer reviewed at the time of publication? We lack information about the history of journals and when the process of peer review began for any given title. Does every work require an indicator whether it was peer reviewed? Are there other formal or informal community standards that should be made explicit and applied? Should standards be extended back in time to bring materials from the past up to date with new standards? Should there be a requirement to add markers and metadata to explicitly identify the open status of a work and to cite it as open access to ensure that provenance? What about retaining other information about licensing or usage that might be lost as information is removed from its original context?

Metrics. There have been calls for reliance on quality not quantity in assessing research. Metrics for impact of scholarly work are diversifying. Impact is measured by links, citations, downloads, views, and increasingly, coverage in social media. Principles can help maintain a system of totally open, transparent, comparable, and verifiable measures of usage and influence. Should we expect to have information on impact available simultaneously with access to the item

and have it be updated in real time? Should new measures be applied retroactively at any point we create new options? If so, where should this type of service live and be maintained? Will there be a charge for this service?

Curation and Stewardship. As the scope of scholarship grows and more forms are accepted, the idea of curation must grow to include more context. The number of services to manage repositories to share research is expanding and research is spread or duplicated among various repositories and platforms. Are third party services, such as Slide Share, Research Gate and Academia.edu, trusted repositories? What should be required to ensure that a third party approach would be an appropriate and reliable answer to maintain stability, and to improve longevity and preservation? Should all aspects of a research project research be all in one place or will linking suffice? Should preservation include an auditing function?

Principles of Reform and Librarianship

The development of principles – the process and the results – is a valuable means of guiding actions and decisions. Open access is considered by many as the crown jewel of scholarly reform. In the practical world, though, there are many steps and barriers to achieving the principle of “must be open.” How will these differences affect service models and actions in librarianship?

Professional principles and values urge librarians to participate in the reimagining of scholarship and the scholarly record, as well as engaging in vigorous debate and advocacy for fundamental principles. The work of librarians presents many opportunities to lead discussions of how principles may apply in scholarly life and learning. Librarians can put in place the human, organizational and technological infrastructures and resources to activate and achieve

principles. Librarians should continue to develop solutions, shared tools and toolkits, professional development, avenues for engagement in the principles of others, and new kinds of research and learning. To effect and sustain change, professional research and practices should evolve to follow the principles promoted and stimulate the application of new ideas.

Librarians should also identify issues and develop the means to understand them. SPARC created a guide that presents a spectrum of openness by which to judge journals.^{lxii} The degrees of openness and their descriptive elements form a strong intellectual and decision-making framework. The guide is not the final word on what makes something open, but it applies to the most common forms and circumstances of scholarly publishing, articles and sources. The ACRL Scholarly Communication Toolkit is designed to aid the navigation of numerous issues and to offer solutions.^{lxiii}

The contributions of librarians can include the establishment of requirements for safe and secure digital repositories, and possibly to provide such repositories. To provide assurance about the future repositories and trusted archives and their contents may be audited for adherence to their missions, preservation strategies, quality and technical standards, sustainability functions, and openness. Academic librarians may choose to have a role in monitoring and facilitating compliance with governmental mandates. Metadata schemas and standards provide another source for interaction with researchers. Networks and collaborations for services enhance scale, stability, reliability, and stewardship that align with the goals of openness, discoverability and persistence. So, too, can librarians contribute to the development of community norms and policies and apply them in their own professional practice.

Librarians, advocates though they may be, often bury internal documents in closed intranets. This content – policies, white papers reports, plans, and other practice documents –

should be freely accessible in digital repositories. Archivists and curators might be more insistent about where any materials of potential research value appear, which may happen at the point of negotiating for the donation of primary resource materials.

Principles are sources for inspiration and instruction for students, budding scholars, and mature researchers, and can aid the making of well-informed decisions and choices. Principles should be part of initiatives that integrate scholarly communication and information literacy.^{lxiv} Instruction is essential to new creativity services - multimedia production and dissemination, 3D design and printing, digital and experimental scholarship, visualization, and integrating the creative use of technology into teaching and the curriculum.

The discussion of principles provides insight into values and expectations, which is essential to healthy relationships. Library and university press partnerships, for example, can create a powerful coalition to affect the scholarly communication landscape and principles. One can appreciate that the shift from the principle of ownership to one of access freed scholarly communication from the constraints imposed by physical ownership in the predominantly print era. We can see now that the role of the library has remained strong and vital despite, or because of, the prominence of digital materials. Moreover, the transition to a digital environment, where more widespread access and sharing has become feasible, has allowed scholarship to evolve and thrive in unanticipated ways.

Principles of scholarly communication are beginning to keep pace with developments in technology, standards, and metadata, and with issues of public policy, social and public good, globalization, social justice, human rights, sustainable development, and rights of indigenous cultures. Ready and reliable access to knowledge - knowledge that is embodied in articles,

books, reports, data, executable files, and the like - has become an essential means of solving local and global-scale problems.

It is important to note two things, the first being that principles may seem abstract or removed from reality, but when they are acted upon they come alive. Second, the practical and the principled are often intertwined. The predictions of the 1990s about how technology would transform scholarship and publishing have come true, but not necessarily in ways that were foreseen. Not all information is open and we will likely live for some time with a mixed system and different layers of access, openness, and transparency. And the evolution and timing of changes have not been predictable. That is why principles provide important touchstones and guidance. The history of scholarly communication suggests that principles, even when they are not perfectly followed, will remain vital to guiding the production and long term care of scholarship.

It is fitting to conclude with a quote from John Willinsky, who succinctly captures and articulates the hopes of the reform movement in his landmark work from 2006, *The Access Principle*. He reminds us that, “A commitment to the value and quality of research carries with it a responsibility to extend the circulation of such work as far as possible and ideally to all who are interested in it and all who might profit by it.”^{lxv}

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