

Mendeley is pleased to have this opportunity to respond to the Office of Science and Technology Policy Request for Information on the topic of public access to peer-reviewed scholarly publications resulting from federally-funded research (<http://federalregister.gov/a/2011-28623>). Mendeley is a 4 year old company that provides services and software to researchers to enable them to organize research, collaborate with colleagues around the world, and discover new research[1]. We have 40 employees in the US and the UK and serve over a million scientists worldwide, with the majority of our users located in the US. We are seeing strong growth, currently adding about 100,000 scientists per month and hiring for several positions in the US and the UK. Our research catalog consists of 150 million research documents, growing by 10 million monthly. Our core business is end-user subscription services provided to scientists, librarians, research and grant administrators, and publishers. Our main objective is to connect researchers with the colleagues and the research that they need to move their research program forward faster and towards this end we are developing innovative approaches to research assessment, expertise discovery, organization and re-use of research data.

Summary

We recognize that publishing incurs certain costs and publishers should be allowed to recover them. However, it's hard to believe that an industry whose revenues have grown four times faster than inflation over the past 25 years will be at any significant risk from Open Access mandates, particularly given the success of the Open Access journals PLoS ONE and BioMed Central and the rush by others in the industry to copy their model. We regret that so little of the efficiencies of the modern Internet era have been realized in scholarly publishing to date, yet we feel this leaves tremendous opportunities ahead for innovation and job creation for the future. We recommend extending a uniform Public Access policy to the other grant-funding federal institutions, including as components of the policy:

- Explicit protection for re-use with license such as the Creative Commons Attribution License (CC-BY)
- No embargo period
- Mandated deposit of the final, peer-reviewed version in either an institutional or centralized repository
- Inclusion of data required for reproducibility
- Incentives for interoperability of repositories via shared metadata schemas

Comment 1

1.a - Are there steps that agencies could take to grow existing and new markets

related to the access and analysis of peer-reviewed publications that result from federally funded scientific research enterprise?

Mendeley creates jobs

Mendeley provides an example of how to create a market around federally funded scientific research. The more open data & documents that are available, the more easily we can connect researchers and the better collaboration tools we can build. This makes our product more valuable and helps us grow. Unfortunately, much of the taxpayer-funded research is currently locked away by commercial publishers, but academic publishing companies such as the Public Library of Science have shown that this isn't necessary for commercial publishing success[2]. Open Access publishing, where the costs of publishing are borne by the author or the funding body, provides a very successful alternative to traditional publishing, where the costs are borne by the subscribers, while at the same time allowing the result of taxpayer funded research to be available as a public good. In addition to the job creation enabled by open access to taxpayer funded research, our economic impact extends more broadly to adding value to other industries and to the creation of new markets. We provide an open API that third-party developers can use to make their own products more valuable. We have API clients in biotech, high tech, green tech, aerospace, earth science, law, and many other industries. This year as part of an innovation challenge judged by technology industry experts Tim O'Reilly, founder of O'Reilly Media, Juan Enriquez, Managing Director of Excel Venture Management, John Wilbanks, former VP for Science at Creative Commons, James Powell, CTO of Thompson Reuters, and Werner Vogels, CTO of Amazon.com, we issued 1000 individual API keys to developers and these third-parties used our API and that of the Public Library of Science (PLoS) to add value to their own products[3]. These developers can build the most useful and feature-rich applications with open data such as that provided by Pubmed Central. The OSTP can best facilitate this creation of value by adopting an Open Access mandate which requires taxpayer-funded research be placed immediately in a public repository, either Pubmed Central or their institutional repository, along with the data necessary for replication of the results. Importantly, Open Access doesn't simply mean free access, but includes full re-use rights, including commercial re-use. All members of the public should be able to benefit from this taxpayer-funded resource. Unfortunately, only about 8% of the scientific literature is currently available under an Open Access license[4]. This suggests that an Open Access mandate requiring immediate public taxpayer access to taxpayer-funded research would result in at least a 12-fold increase in the productivity of scientists, the return on investment of federal grant monies, and job creation opportunities.

One example of development made possible by open data is OpenSNP.org which is a service that provides customers of genetic screening services with information about their screening results. These customers typically aren't researchers themselves so open access is absolutely necessary for them to make use of the information uncovered by OpenSNP. There are also professional associations building knowledge bases for their membership, engineering firms using open access to stay on the cutting edge of technology, and biotech companies that need access to research to design the next generation of drugs and therapies[3].

1.b - Growth of new tools to analyse peer-reviewed publications - ‘article-level metrics’ and innovation

Full Open Access to taxpayer-funded scholarly literature and the data accompanying such publications can help promote the development of tools which enable scientists, research administration offices, grant review boards, and faculty tenure review committees find and measure the impact of work they’ve published or funded. These tools could allow grant funds to be spent more effectively, technologies brought to market faster, and cures discovered faster. However, these metrics must look across the breadth of scholarly output to be successful, yet only 8% of scholarly publications are available as open access[4], so Open Access mandates are critically important to support the development of these tools.

For historical reasons, only one metric, the Journal Impact Factor, is currently in common use. However, this metric only reports the average number of citations a journal gets in a year divided by the number of articles published - it doesn’t show the impact of individual articles. This metric has been found to be less predictive of research program success than some alternative metrics[6], such as the Hirsch index, due to the wide variation in citations accruing to individual articles within a journal.

Some examples of nascent research metrics services enabled by Open Access mandates:

readermeter.org

total-impact.org

alm.plos.org

Reader Meter determines a reader’s impact by looking to see how many papers they have in Mendeley’s literature database and how many people are reading those documents. Analogous to the Hirsch index, a popular citation metric, Reader Meter gives you a score of 5 if you have 5 documents with 5 or more readers.

Total Impact looks at the broader picture of a researcher’s output, incorporating article-level metrics from a variety of sources such as Mendeley and PLoS. It can also be extended to cover datasets and published bibliographies and other types of researcher output beyond published papers.

The Public Library of Science’s Article Level Metrics shows the broader impacts of work, allowing more sophisticated analysis of research impact than previously possible.

1.c Growing the economy and improving the productivity of the scientific enterprise.

Open Access promotes scientific productivity because it allows researchers, whether commercial or academic, to access the latest scientific findings without restriction and to begin to immediately build upon those. Such aggregative building is necessary because a new drug or new technology is developed not on the basis of one publication, but by accumulating knowledge over time from many researchers studying a given topic. There is increasing evidence for one obvious-in-hindsight effect of Open Access - Open Access works are read more and cited more by subsequent papers[7]. Open Access also promotes the use of research

materials in classes, helping to keep American students at the top academically and promoting better patient education.

Open Access also serves Mendeley in its mission to make scientists more productive. There are two main scenarios where Mendeley enhances the productivity of those who use open data and documents:

Has access, needs discovery tools

A researcher's productivity can be enhanced in a number of ways, but given that most of a researcher's work goes into finding all the ways that *don't* work, a really effective way to improve productivity would be to get the right documents into the right hands at the right time. Mendeley and the ecosystem of third-parties we enable, do that by two fundamental mechanisms, search and recommendation, both of which work best with Open Access content.

Search

It has traditionally been a time-consuming and laborious process for a researcher to find and organize all the research related to their project. However, there are some job creation opportunities provided by Open Access mandates to make this process much faster and easier and to connect previously unconnected disciplines. Even in the relatively rare case where a researcher has subscription access to everything they need, they must spend less time trying things people have already figured out don't work and less time in manual organization of research collections, if they want to work efficiently and make best use of their grant money. Modern researchers depend in practice on search of databases for related keywords both to track current research and to survey the state of knowledge about an idea or technique they wish to employ. However, many common words have discipline specific meanings, such as replication (cellular or of digital storage volumes) or transformation (spiritual, mental, or in the cellular meaning, the process of becoming cancerous). No one central authority can provide all the facets that different research groups would want, but by enabling open access to the aggregated set of literature, we can empower groups to make their own facets, which is exactly what many of the applications built using our Open API are doing. Additionally, no one publisher can provide an index across all publications across an entire discipline. This requires a "neutral" repository that can return all the relevant results for a given query. Mendeley provides such a repository. Getting the right information to the right researcher when he needs it also requires ranking of documents so that not only all matching documents are found, but the best ones are returned first. This means discoveries are made faster, communicated faster, and allows science to be more efficient. Open Access mandates therefore present the publishing industry and the technology industry with an exciting opportunity for growth that promotes efficient science, cross-discipline collaboration, and creates jobs.

Recommendation

One way to think about recommendation as a class of discovery mechanism is to think of it as "searches you haven't run - yet". By looking at the reading and sharing history of a researcher and comparing that history to the sharing history of other researchers, we can determine what a researcher may want to read but hasn't even searched for yet. A similar sort of recommendation helped Amazon.com grow into an \$11M company. However, this type of service requires a vast amount of data to be really useful. No one publisher can get this scale of data about all publications, including those from other publishers. Only by looking over the aggregated reading activities of a large number of researchers reading diverse literature is this truly useful, and only with open licenses such as CC-BY and Open Access mandates will it be

possibly to realize this enormous opportunity for revenue generation and job creation.

Doesn't have access, needs it, also needs discovery tools

In the more common case, where a researcher doesn't have all the access he needs, he will necessarily spend more time trying things that don't work or re-optimizing a method that someone else has already optimized.

Diversion of research funding

Another issue is the amount of resources that are taken out of university and grant budgets and diverted into subsidizing the existing publishing infrastructure. Little of the cost savings of the digital age have been realized in scholarly communication, despite the Internet having been created exactly for this purpose!^[9] Services such as Arxiv.org and Pubmed Central provide an example of an efficient publication distribution system, which maximizes the amount of federal grant money that goes to actual research and minimizes the funds necessary for just for curating, archiving and communicating those results. This allows science to progress faster and new industries to be created to give provide American workers the jobs of the future.

1.d The costs and benefits of Open Access policies

According to the Houghton Reports^[10], Open Access will increase the value of investment by a factor of five. Their analysis shows that, while subscription revenue to publishing companies may decline, that decline is more than offset by the growth of new technologies and by job creation stimulated by improved scientific productivity. Expanding the NIH-style policy to all other federal agencies, without embargo, is projected to create \$1.5 Billion in new revenues, 60% of which will directly benefit the U.S. economy.

In addition to job creation through innovation, the creation of new markets, and improved scientific productivity, it will promote badly needed competition among publishers to realize some of the cost savings possible with the Internet and modern technology. Subscription costs have increased four times faster than inflation over the past 25 years, resulting in severe problems for libraries in providing access to research for their institutions. Open Access repositories such as Pubmed Central don't come without a cost, of course. The NIH reports that it costs about \$4M annually to provide access to 2.2M articles for 500,000 users per day, the majority of which are not accessing the site from an academic institution^[11]. This is less than 0.01% of the NIH annual budget, which stands in sharp contrast to the approximately \$2B that it costs traditional publishers to provide subscription-only access. By keeping extending the NIH policy, without embargo, to all federal research funding agencies, greater access can be provided while minimizing infrastructure costs.

1.e What type of access to these publications is required to maximize U.S. economic growth and improve the productivity of the American scientific enterprise?

A full Open Access license is the only one which will allow the above benefits to be realized.

The difference between free access and Open Access is important to understand. A license that only permits end-user to read a published work for free but excludes derivative reuse will not unlock the potential of this taxpayer-funded resource. The license applied to the published work must not limit the rights of third parties to make derivative copies or any other kind of re-use

although attribution requirements are acceptable, in keeping with the long-standing scholarly tradition of crediting others for their work. The reason the license needs to be permissive of reuse is that third parties are expected to include computers, and tracking myriad licenses across the thousands of works that may comprise a single derivative work presents such a barrier as to make creation of such works technically infeasible. Examples of such derivative works include automatic translation of published works or services which recommend related works. The preferred license to enable the benefits of increased scientific productivity, greater return on federal grant monies, and job creation is the Creative Commons Attribution license, CC-BY[12], which is used by the Public Library of Science and BioMed Central, the leading Open Access publishers.

Professor Michael Carroll, Professor of Law, Washington College, Director, Program on Information Justice and Intellectual Property and Member of the Board of Creative Commons explains[13]:

“Granting readers full reuse rights unleashes the full range of human creativity to translate, combine, analyze, adapt, and preserve the scientific record, whereas traditional copyright arrangements in scientific publishing increasingly are inhibiting scholarly communication. Traditional copyright law was designed with the subscription-based publishing model in mind. Authors receive copyright when they write their first draft of an article. Authors then transfer this copyright, or grant an exclusive license, to a publisher in exchange for publication. The publisher relies on copyright to police the behavior of readers and competitors who may seek to obtain or redistribute the content without a subscription.

By shifting the financing away from subscriptions, the open-access model realigns copyright to enable broad reuse while assuring authors and publishers that they receive credit for the work they have done. This is done through open licensing by the copyright owner. Initially, the authors of an article automatically own a copyright in the article as soon as it has been drafted. If the authors sign an agreement that transfers the exclusive rights to the publisher, the publisher becomes the copyright owner. The standard means for achieving open access with respect to copyright is for the copyright owner (author or publisher) to use the Creative Commons Attribution license, which gives readers and republishers broad reuse rights on the condition that credit for the article is given as directed by whoever is granting the permission. (Disclosure: I sit on the Board of Creative Commons.)

Recently, however, some commercial publishers have waded into the open access waters by charging authors a publication fee to substitute for subscription revenue while limiting reuse. Having been paid for coordinating peer review, editing and laying out the text, and the like, these publishers nonetheless limit readers to making only non-commercial reuses, or even also requiring reusers to use the same license for any adaptations, while reserving to the publisher the rights to make any commercial reuse. (This is done through use of the Creative Commons Attribution Non-Commercial license or the Creative Commons Attribution Non-Commercial Share-Alike license.) This is pseudo open access. Authors who pay for publication in these pseudo open access publications are not getting their money's worth. For example, text or figures subject to these more restrictive licenses cannot be uploaded to Wikipedia, which uses the Creative Commons Attribution Share-Alike license.

Presumably, these publishers retain commercial reuse rights either to derive additional revenues from certain potential reusers or to block competitors, who may exercise these reuse rights to earn revenue through some kind of value-added service or publication. This latter option is possible only if the competitor discovers a market that the original publisher

overlooked. Such entrepreneurs should be rewarded rather than controlled.”

Federal funding agencies must require an Open Access license such as CC-BY that explicitly allows commercial re-use to allow the economic benefits and enhanced job creation to be realized.

Comment 2

What specific steps can be taken to protect the intellectual property interests of publishers, scientists, Federal agencies, and other stakeholders involved with the publication and dissemination of peer-reviewed scholarly publications resulting from federally funded scientific research?

Publishers provide a valuable service by overseeing the production, typesetting, and coordination of pre-publication peer review. They should be allowed to recover their costs and compete based on quality of service and price. However, once the service has been provided, they should not be allowed to restrict future use of articles containing research funded by the American taxpayer and peer-reviewed not by the publisher, but by researchers. It is the researchers who are the producers and consumers of these articles and so they have an interest in safeguarding the intellectual rigor of the body of work. Because this review work is done by researcher without compensation by publishers, they have intellectual property interests in the works as well, and those interests should not be overridden by publishers.

Legal protection for the rights of a researcher in their work, such as that provided by a CC-BY license, is the best way to balance the intellectual property interests of publishers, scientists, Federal agencies, and other stakeholders.

Comment 3

What are the pros and cons of centralized and decentralized approaches to managing public access to peer-reviewed scholarly publications that result from federally funded research in terms of interoperability, search, development of analytic tools, and other scientific and commercial opportunities? Are there reasons why a Federal agency (or agencies) should maintain custody of all published content, and are there ways that the government can ensure long-term stewardship if content is distributed across multiple private sources?

Centralized repositories provide the advantage of simplicity and consolidation of resources, but the disadvantage of slowing innovation in public access repositories because decisions on new ways of adding value to the data and enhancing its reuse will necessarily require a larger number of stakeholders. Web-scale indexing and open APIs have reduced many of problems of federated or decentralized approaches and subject repositories such as Arxiv.org, ADS, and SSRN are examples of successful distributed repositories hosting work that has benefited to various degrees from federal funding. As long as all the repositories provide open APIs, there's no compelling need for the government to maintain custody of published content. Recognizing that a national archive is a valuable public good, the government can ensure long-term stewardship of distributed content by enforcing the use of a license that allows reuse, such

as CC-BY.

Comment 4

Are there models or new ideas for public-private partnerships that take advantage of existing publisher archives and encourage innovation in accessibility and interoperability, while ensuring long-term stewardship of the results of federally funded research?

With our position between private enterprise and public partnerships, Mendeley provides a great model for innovation which takes advantage of existing archives while promoting long-term stewardship. Mendeley has participated in a number of public-private partnership projects that set an example for how future innovation may take place. By partnering with Symplectic and individual academic institutions such as the University of Cambridge as part of the JISC-funded Direct User Repository Access project[14], Mendeley allows universities to increase utilization of local institutional repositories while promoting the visibility and discovery of content already found in these repositories. This promotes long-term stewardship by placing the content under the charge of the institutional repository which is tasked with preservation, but also enhances accessibility and interoperability by providing a common platform for discovery.

Additionally, through a partnership with SWETS and individual institutions[15], we can provide universities and research administration offices a common platform for assessing the research impact of faculty and assessing subscription usage and needs among faculty, saving universities thousands by enabling more intelligent budgeting of research and subscription funds.

Mendeley will continue to pursue new innovations in this area and also to partner with publishers such as PLoS to pursue new opportunities for market creation and job creation. Enabling reuse through CC-BY licensing will also promote long-term stewardship and promote innovation.

Comment 5

What steps can be taken by Federal agencies, publishers, and/or scholarly and professional societies to encourage interoperable search, discovery, and analysis capacity across disciplines and archives? What are the minimum core metadata for scholarly publications that must be made available to the public to allow such capabilities? How should Federal agencies make certain that such minimum core metadata associated with peer-reviewed publications resulting from federally funded scientific research are publicly available to ensure that these publications can be easily found and linked to Federal science funding?

To promote interoperability, it's important that the metadata (the data that describes the works) schema is broad enough that individual repositories can integrate their data but specific enough that individual versions of works can be distinguished. Scholarly publishers and repositories should support the National Library of Medicine XML Document Type Definition and the Dublin Core metadata schema[16]. Deposit of works should come with a Digital Object Identifier (DOI)

and should maintain compatibility with requirements of the Open Researcher and Contributor ID, an emerging standard for identifying researchers[17].

To promote innovation such as development of the semantic web, publishers and repositories should provide an Application Programming Interface (API) which enables inter-repository and third-party applications to exchange data. The works should be classified according to public domain taxonomies and these classifications should likewise be made available via API or other machine readable format. Where possible, scholarly societies, publishers, and repository maintainers should work together on shared taxonomies to facilitate interoperability.

Comment 6

How can Federal agencies that fund science maximize the benefit of public access policies to U.S. taxpayers, and their investment in the peer-reviewed literature, while minimizing burden and costs for stakeholders, including awardee institutions, scientists, publishers, Federal agencies, and libraries?

Federal agencies can maximize the benefit of public access policies and get the best return on investment by developing a public access policy that is consistent across all federal grant funding agencies. This is particularly the case for research fields, such as biotechnology, which is often funded by more than one different agency, for example, the NIH and the DOE. A consistent federal policy will also reduce duplication of effort and minimize costs while promoting interoperability.

To achieve maximum benefits in cost-saving, research productivity enhancement, and job creation, these policies should:

- include a uniform licensing requirement using a license which protects reuse, such as CC-BY.
- mandate immediate deposit of the final, peer-reviewed version of the publication in a public access repository
- mandate deposit of the metadata and any associated data or code along with the publication
- enable the development of research evaluation tools such as Mendeley's readership index and PLoS's article-level metrics
- facilitate the development of data sharing and data management plans

Comment 7

Besides scholarly journal articles, should other types of peer-reviewed publications resulting from federally funded research, such as book chapters and conference proceedings, be covered by these public access policies?

The entire output of all federally-funded research should be covered by these public access policies. This includes book chapters and conference proceedings, as well as data and code developed under federal grant. This does not preclude book authors and publishers from compiling textbooks or print copies of conference proceedings and offering those for sale under a more restrictive license, provided the license chosen for the public access policy is a non-restrictive license such as CC-BY which permits commercial reuse.

Comment 8

What is the appropriate embargo period after publication before the public is granted free access to the full content of peer-reviewed scholarly publications resulting from federally funded research?

The best policy for scientists, for encouraging innovation, and for getting the best economic impact of federal grant monies is no embargo period. PLoS provides an example of a publisher which needs no embargo period and which continues to enjoy significant commercial success. Because commercialization and job creation don't arise from one single publication, but from the aggregate of multiple publications over time, any embargo period applied at the article level would slow down scientific progress and inhibit commercialization. Because many commercialization and market creation opportunities lie at the intersection of different fields, the policy should be uniform across all subject areas.

Please describe the empirical basis for the recommended embargo period. Analyses that weigh public and private benefits and account for external market factors, such as competition, price changes, library budgets, and other factors, will be particularly useful. Are there evidence-based arguments that can be made that the delay period should be different for specific disciplines or types of publications?

The effect of embargoes has been studied by the Research Information Network, the Joint Information Systems Committee, the Publishing Research Consortium, Research Libraries UK, and the Wellcome Trust[18]. They concluded that embargoes would deny many of the immediate benefits of Open Access while not providing incentives for publishers to transition to Open Access over time. They also found significant sustainability risks due to the greater reliance on the subscription model and recommended the Gold OA model, where publication fees are paid to the publisher in exchange for immediate Open Access of the work, as the approach which will achieve the best benefit/cost ratio.

"In our view, therefore, while there is no harm in policy-makers encouraging it as a low-cost and arguably lower-risk way of expanding access, it is unlikely in practice to provide significant changes in access."[19]

While it may be argued that the citation advantage of Open Access article proves that embargoes do not do harm to scientific productivity, we don't have evidence to show how large the citation advantage might be if there were no embargoes and all works were Open Access. Open Access without embargo is particularly important for public understanding of scientific results. Often, research is reported in the lay media before the public can access the original research and this leads to public misunderstanding of science and presents a public health risk in conjunction with media reports about the health risks of treatments, for example. In the UK, a recent editorial by George Monbiot called embargoes a "tax on education, a stifling of the human mind"[20]:

"I refer readers to peer-reviewed papers, on the principle that claims should be followed to their sources. The readers tell me that they can't afford to judge for themselves whether or not I have represented the research fairly. Independent researchers who try to inform themselves about

important scientific issues have to fork out thousands. This is a tax on education, a stifling of the public mind. It appears to contravene the universal declaration of human rights, which says that "everyone has the right freely to ... share in scientific advancement and its benefits"

If embargoes are causing people who want to understand the research being paid for with their taxes to have to pay thousands for access to the research, then embargoes are clearly not a risk-free option. On the other hand, the commercial success of publishers such as PLoS and BioMed Central, and Hindawi shows that embargoes do not necessarily help, either. The growth of new journals that copy the success of the journal PLoS ONE, which imposes no embargo and uses a CC-BY license, shows that there is broad understanding in the industry that this model is a proven and successful one. A few examples of new journals using this model are BMJ Open, from the British Medical Journals group; G3, from the Genetics Society of America; Scientific Reports, from Nature Publishing Group; and AIP Advances, from the American Institute of Physics.[21]

Please identify any other items the Task Force might consider for Federal policies related to public access to peer-reviewed scholarly publications resulting from federally supported research.

As discussed above in comment 7, federal agencies should also adopt uniform policies regarding the data associated with publications they fund. Sharing of raw data is as important as the publications, because when data are published, they are often turned into tables and images, which aren't as useful to researchers looking to replicate or extend the work. The UK House of Commons Select Committee on Science and Technology said, *"Access to data is fundamental if researchers are to reproduce, verify and build on results that are reported in the literature ... The presumption must be that, unless there is a strong reason otherwise, data should be fully disclosed and made publicly available. In line with this principle, where possible, data associated with all publicly funded research should be made widely and freely available...The work of researchers who expend time and effort adding value to their data, to make it usable by others, should be acknowledged as a valuable part of their role."* [22]

Data repositories such as Genbank provide a model for how this sharing can work and new initiatives, such the Open Knowledge Foundation's Working Group on Open Data in Science, are trying to build the infrastructure and culture to facilitate data sharing to this end [23]. We recommend the following:

- require that the data needed to replicate a research finding be made available at the same time as the article is published
- require that use of data is given proper citation credit
- incentives for providing data and citing data are developed.

We appreciate the opportunity to respond to this RFI and hope this comment usefully guides policy decisions.

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