

**Response to Request for Information: "Public Access to Digital Data Resulting from Federally Funded Research," November 2011
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Thank you for the opportunity to comment on "Public Access to Peer-Reviewed Scholarly Publications Resulting from Federally Funded Research." These comments are submitted on behalf of the University of Minnesota Libraries. The University of Minnesota is one of the leading public research institutions in the United States, and a key contributor to the entrepreneurial economy of the state of Minnesota, as well as to scholarship both nationally and internationally. We strongly advocate for a policy requiring full public access to all publications resulting from federally-funded research as soon as possible after publication. We believe that such a policy would provide immeasurable public benefits far outweighing any costs or burdens such a policy might impose.

(1) 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? How can policies for archiving publications and making them publicly accessible be used to grow the economy and improve the productivity of the scientific enterprise? What are the relative costs and benefits of such policies? What type of access to these publications is required to maximize U.S. economic growth and improve the productivity of the American scientific enterprise?

1.1 Costs and Benefits: The Challenges We Face Today

Simply put, the present environment of limited access to most research publications imposes many costs across many sectors of the U.S. economy. Increasing access to research publications may impose some burdens on publishers -- although it is by no means certain that a well-crafted open access policy will in fact damage publishers' bottom lines -- but it will unquestionably benefit many others. Here are a few concrete examples from the state of Minnesota of the challenges scientists, industry professionals, and members of the public currently face in accessing publicly-funded research:

- The University of Minnesota Chemical Engineering and Materials Science department runs a fellowship program in partnership with technology businesses. Enterprise partners sponsor fellowships for industry professionals (often scientists from their own research divisions) to collaborate with students and researchers at the University of Minnesota. Research fellows in this program perennially inquire about access to SciFinder, one of the most important subscription information resources in chemistry.

Unfortunately, SciFinder is one of the very few licensed resources for which even on-campus access is limited to University personnel by the terms imposed by its publisher, the American Chemical Society, and we are not able to provide access under any circumstances to these unaffiliated individuals. Since a large portion of the research available in SciFinder is the result of federal funding, a policy *increasing access to federally funded research would demonstrably improve the resources available to these researchers.*

- The University of Minnesota Extension program has a history of over 100 years of bringing the scientific knowledge and expertise of the University out into our communities, in partnership with federal, state, and county governments. The Extension program is vital to the health of individuals and communities, both urban and rural, across the state. It is also a key contributor to the success of the agricultural, environmental, and tourism industries throughout Minnesota.

Extension educators already make comprehensive use of education and information resources produced by federal agencies, knowing that these resources are free for all to use. However, Extension educators frequently wish to share research publications with their service communities. The growth of PubMed Central as a result of the NIH open access policy has been a great boon for Extension public health educators, but Extension faculty and staff in agriculture and environmental sciences are often limited to sharing abstracts or rough summaries of research data with their service communities.

Increased access to federally-funded research would allow Extension educators to get research into the hands of individuals who can put that research directly into practice in Minnesota's communities, and in some of Minnesota's most important industries. Moreover, many of the individuals, non-profits, and government programs with which Extension educators work have limited access to the Internet due to limited financial resources or remote rural locations, so re-use rights such as the ability for Extension educators to photocopy and distribute publications, or compile them into educational materials, would be immeasurably helpful to truly getting the research into the hands of practitioners.

1.2 Improving the Productivity of the Scientific Enterprise – Citation Impact

Scientists and scholars measure the productivity of the research enterprise primarily in terms of the spread of knowledge and the impact of their own research among their peers. Some of the best and brightest agree that “[b]road dissemination of research results is fundamental to the advancement of knowledge.”¹ Less altruistically, faculty across all disciplines report availability to peers in their disciplines as the most compelling factor in their choices of publication venues.² One of the best ways to measure whether research is available to other scholars and scientists is to track citations of publications – and numerous studies have documented that making works openly available increases the numbers of citations to each work. Wagner’s annotated

¹ An Open Letter to the U.S. Congress Signed by 41 Nobel Prize Winners. (2009, November 6). Retrieved January 8, 2012, from http://www.taxpayeraccess.org/supporters/scientists/nobelists_2009.shtml

² Schonfeld, R. C., & Housewright, R. (2010). *Faculty Survey 2009: Key Strategic Insights for Libraries, Publishers, and Societies*. Ithaka S+R. Retrieved from <http://www.ithaka.org/ithaka-s-r/research/faculty-surveys-2000-2009/Faculty%20Study%202009.pdf>

bibliography shows about 39 articles demonstrating an open access citation advantage (OACA).³ Another study (Gagouri, et al) responding to suggestions that OACA is simply a product of selection bias (i.e., that scholars only make works open if they are particularly likely to be cited), recently argued that there is a bias toward high-quality work in open access, but also noted that increased citation is in fact an independent phenomenon and real benefit of open access.⁴

1.3 Improving the Productivity of the Scientific Enterprise – Economic Impact

Another way to measure the productivity of the scientific enterprise is to consider the economic impact of scientific research. Commercialization is one valuable way to realize economic benefits from publicly funded research. However, researchers in intellectual property policy applaud the value of private research, but point out that the economic value of research cannot be measured solely in terms of commercial exploitation: the unquestionably hugely valuable Human Genome Project would have provided far fewer scientific *and* commercial benefits in private hands.⁵ Other researchers have demonstrated that opening access (i.e., limiting IP restrictions) to patentable products of bioengineering research both increased the volume of follow-on research and increased the diversity of uses to which the original advances were put.⁶ Increasing open access to research may provide a wide range of economic benefits. Economists John Houghton & Peter Sheehan suggest several specific areas in which the economic impact of open access to research might be felt,⁷ including:

- Speeding up research through faster access, potentially increasing return on both private and public investment in research.
- Reducing redundancy and duplicative efforts through wider access.
- Improving collaboration across disciplines and institutions through wider access, and potentially increasing the ability to recognize commercial applications.
- Reducing costs of education, producing a better future research workforce.
- Increasing access to individuals in health care, education, and smaller industrial enterprises, hence improving their productivity and service levels.
- Possible new industries developing around openly available content.
- Producing better informed citizens and consumers who can make more socially beneficial choices about their lives and the services and products they consume. (We would add that these better-

³ Wagner, A. B. (2010). *Open Access Citation Advantage: An Annotated Bibliography*. Issues in Science and Technology Librarianship. doi:10.3998/3336451.0009.202

⁴ Gargouri, Y., Hajjem, C., Larivière, V., Gingras, Y., Carr, L., Brody, T., & Harnad, S. (2010). *Self-Selected or Mandated, Open Access Increases Citation Impact for Higher Quality Research*. PLoS ONE, 5(10), e13636. doi:10.1371/journal.pone.0013636

⁵ Eisenberg, R. S., & Nelson, R. R. (2002). *Public vs. Proprietary Science: A Fruitful Tension?* Academic Medicine, 77(12), 1392-1399.

⁶ Murray, F., Aghion, P., Dewatripont, M., Kolev, J., & Stern, S. (n.d.). *Of mice and academics: Examining the effect of openness on innovation*. NBER Working Paper Series, (14819). Retrieved from <http://nrs.harvard.edu/urn-3:HUL.InstRepos:4554220>

⁷ Houghton, J., & Sheehan, P. (2006). *The Economic Impact of Enhanced Access to Research Findings*. Center for Strategic Economic Studies Working Paper Series, (23). Retrieved from www.cfses.com/documents/wp23.pdf

informed citizens may themselves contribute directly to research gains, in the form of the already-growing participation in “citizen science” efforts such as Stardust@home and Zooniverse.)⁸

Houghton’s economic research carefully models how increased accessibility and efficiency of research might affect the return on R&D investment in many different countries. In a 2006 article, his most conservative models predicted a \$1.5 billion annual gain in a move to open access; the middle-of-the-road models predicted annual gains of over \$16 billion.⁹ More recently, Houghton assessed the costs and benefits of the proposed FRPAA legislation within the U.S. (benefits approximately 5x costs) and overall (benefits approximately 8x costs.)¹⁰

The University of Minnesota research enterprise is currently estimated to contribute about \$1.5 billion to the Minnesota economy each year. University of Minnesota alumni have founded at least 10,000 businesses in the state.¹¹ Imagine how much greater that contribution could be if more of the research produced by the University was made available to the public. Although full access to publications resulting from federally-funded research may impose some costs on publishers, it would not significantly affect the publication process or impose new burdens on researchers, and the examples above demonstrate how such access could directly improve the work of innovators and industry professionals. Full access and re-use rights could also enable development of innovative tools by programmers in both commercial and open-source environments enabling new forms of search, analysis, and connectivity for published research.

(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? Conversely, are there policies that should not be adopted with respect to public access to peer-reviewed scholarly publications so as not to undermine any intellectual property rights of publishers, scientists, Federal agencies, and other stakeholders?

2.1 The Intellectual Property Interests of Stakeholders in the Research Process

All of the named stakeholders have an interest in *making use* of the results of research. However, to the extent that publishers have an intellectual property ownership interest in the published results of research, it is coterminous with the copyright interests of researchers, and is usually acquired from them with no remuneration, and in fact sometimes at a cost to the researchers. Researchers *produce* intellectual property as a direct result of federal research funding; publishers *acquire* a copyright interest in research products after they have been created. It should be noted that publishers do contribute valuable editorial, promotional, and other functions to the publishing process, but only require distribution rights to fulfill their role.

⁸ Stardust@home <http://stardustathome.ssl.berkeley.edu>; Zooniverse <https://www.zooniverse.org>

⁹ Houghton, J., & Sheehan, P. (2006). *The Economic Impact of Enhanced Access to Research Findings*. Center for Strategic Economic Studies Working Paper Series, (23). Retrieved from www.cfses.com/documents/wp23.pdf

¹⁰ Houghton, J.W., Rasmussen, B. and Sheehan, P.J. (2010) *Economic and Social Returns on Investment in Open Archiving Publicly Funded Research Outputs*, Report to SPARC by Victoria University's Centre for Strategic Economic Studies. Retrieved from <http://www.cfses.com/FRPAA>

¹¹ Tripp Umbach. (2011). *The Economic and Societal Impact of the University of Minnesota*. Retrieved from http://impact.umn.edu/assets/pdf/Final_Report.pdf

Policy choices for federally-funded research publications can have little effect on the intellectual property rights of most participants in the process of scientific research, because no open access policy will change established intellectual property laws. No one has documented any increased risks of infringement on the intellectual property rights of any stakeholder under existing open access policies. Existing policies have admittedly already changed *practices* surrounding researcher management of their rights and the acquisition of rights by publishers from scholarly authors – but these changes have meshed quite well with the intellectual property interests and practices of authors and most other participants in the process.

2.2 Specific Intellectual Property Interests – Patent and Copyright

Patent rights are only indirectly implicated in the publishing process, as researchers generally do not publish or publicly comment on potentially-patentable innovations until the patent application process is well underway. A policy that requires open access to published research does not threaten the patent rights of researchers, funders, or supporting institutions - or businesses that build on these efforts - since the appropriate rights-management processes are already established, and equally applicable to all research publication, in any medium or any access mode. Upcoming changes under the America Invents Act will only reduce the effect that publications can have on the patentability of research; under the new regulations, patents will be awarded to the first party to file an application, regardless of the date of invention. Publication before filing may still create “prior art” that can undermine patentability, but these risks will be unchanged from the current system, and are well-managed by researchers.

Copyright rights, on the other hand, are directly implicated throughout the publishing process. However, no particular approach to distribution inherently affects the copyrights in research publications, since copyrights cannot be transferred except via a formal licensing agreement or written transfer. The copyright status of an article is the same whether it is published on paper, in a limited-access online service, or made freely available online to all. A policy which requires research publications to be made freely *available* to all does not affect the copyright in those publications. Open online distribution does increase the visibility of research, which can sometimes lead to increased opportunities for infringement. However, there is no evidence that open publications are more frequently infringed than limited-access publications – in fact, since openness reduces barriers to legitimate access, open publications may be less likely to be copied by questionable or illegitimate means. Some may fear that broader access will lead to increased copyright infringement, but there is no evidence of this with current open access publications – and where there are fewer limitations on access and use, there are fewer opportunities for infringement.

Enabling full *access* to research publications still falls short of enabling a number of uses that could be highly beneficial to scholars, industry, and members of the public. A work that is publicly accessible is still subject to all the limitations of copyright, which may present barriers to many productive uses. A policy enabling wide public *re-uses of* (rather than simply access to) publications would create additional value. Teachers would be certain they could reproduce the articles for their students. Scholars could reproduce the text for new and emerging forms of computational analysis. Entrepreneurs and developers could build new tools, services, and device applications related to these publications without worrying about reproduction or derivative work

rights. Existing open licensing tools such as Creative Commons licenses (specifically, a Creative Commons Attribution CC-BY license) would enable all of these uses, while ensuring full credit to researchers.

Unquestionably, such a policy would have a direct impact on the copyright in those publications. Wherever the copyright in the publications may lie (with the researcher, the publisher, or shared among multiple parties), the copyright holder(s) would necessarily have to cede some control under an open re-use policy. However, it is worth noting that *researchers usually do not currently control or receive remuneration* for any of these uses, and Federal agencies, research institutions, and other stakeholders currently usually must *pay for these uses*. While a policy requiring wide public usability for published research might require cession of some copyrights currently controlled by publishers, it would not materially change the rights that researchers currently control. It would also provide dramatically increased usability for many stakeholders in the system of scientific innovation.

(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 bring great benefits, such as providing an authoritative copy of a publication (and if necessary, including corrections or retractions), maintaining a single access point for direct searches across large bodies of research, and establishing interoperable access mechanisms. Centralized hosting is the best opportunity to maintain the integrity of the published research, and maintain public access over time. Centralized hosting will also result in greater innovation around research content. Decentralized access necessitates the development of tools to search across multiple repositories, which may sometimes result in beneficial innovations in search functionality, but usually simply results in less-than-optimal search experiences. Centralized access with open infrastructures, on the other hand, introduces numerous efficiencies, which can enable development of innovative third party search, analysis, and other tools. PubMed Central, the central repository under the NIH open access plan, has proven invaluable in improving access to federally-funded health research. Searchers know where to go, and know that the copy they are accessing is the copy of record.

However, we do support a managed strategy for redundant copies to ensure long-term access to authentic works. These copies could be stored in library and institutional archives, in subject repositories, and with publishers. A policy that enables extensive re-use by both commercial and non-profit users (such as under a Creative Commons Attribution CC BY license) would remove barriers to decentralized storage, and would maximize experimentation and innovation with published resources, regardless of their home.

We do not advocate for a policy that leaves the provision of enduring access solely in the hands of commercial publishers; ideal primary deposit is in repositories hosted by the government and/or non-profit institutions and organizations. The goals of most corporate publishers are to maximize profits for their shareholders – this is absolutely appropriate, but in pursuit of those goals archives often change hands. These are not ideal

conditions for preserving access to published research. Any library staff member who works with licensed electronic resources has numerous stories to tell about access lost – sometimes temporarily, but sometimes for long periods - when one publisher was acquired by another. The worst cases include permanent loss of data and are not easily repaired. It is not unheard of for a publisher to contact a library in search of back print copies of a journal to re-digitize to replace a lost (or never-created) archive. The federal government or universities, by contrast to publishers, are long-lived institutions, and the public-oriented goals of federal research funding are more stable over time.

(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?

Libraries, museums, and other cultural institutions throughout history are good examples of public-private partnerships that ensure access to and long-term stewardship of the items in our collections. Traditionally, libraries have acquired books by purchase and both preserved them and made them accessible to the public over time. As acquisition of materials for library collections has increasingly shifted to a licensed-access model, it has been increasingly difficult for libraries to leverage our expertise and experience in providing access and preservation. The terms of many licenses preclude libraries from storing and providing access to the materials, leaving the task of providing long-term preservation and access in the hands of publishers.

Some publishers have developed innovative tools for accessing published research, but they have been less successful at making these tools, or their separate article archives, interoperable. It is still a difficult programming task to build a tool that searches across multiple commercial databases because each is formatted differently. By contrast, the systems that libraries and other non-profit entities have built to host content generally have robust systems for access by outside programmers, and follow strong standards to ensure interoperability. The HathiTrust Digital Library, for example, has robust APIs that allow export and interoperability of all HathiTrust data, including the full text of public domain works. Using the API, many public domain works are now available for purchase as physical copies via Amazon.com. Unfortunately, due to rights limitations, libraries are often unable to apply these robust tools to the most current content. Third-party applications and innovations *can* be built via collaboration with publishers – much of the discoverability data in Google Scholar, for example, is provided directly by publishers. But many entrepreneurial developers need to engage in experimentation or proof-of-concept testing, and may not have the financial or social capital to negotiate with publishers; even Google Scholar was initially developed using only publicly available discoverability data. Policies that require enforceable and robust open standards for storage and access would allow improved collaboration between publishers and libraries and other cultural institutions. Such policies would also enable innovation by third-party actors large and small.

We believe that permanent storage in a public archive compliant with repository standards such as OAIS and the emerging ISO/DIS Standard 16363 for Trusted Digital Repositories is a necessary part of long-term stewardship of published research, and that partnerships between publishers, libraries, higher education institutions, and government agencies can most robustly support the long-term preservation and access to federally-funded research publications.

(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?

The best way to encourage interoperable search, discovery, and analysis is by using standardized metadata schema appropriate to the materials in question. There are many relevant existing standards to draw from: the protocols of the Open Archives Initiatives represent a reasonable minimum metadata standard across disciplines, and the National Information Standards Organization promulgates many relevant metadata and other standards. Community-based expertise should be used to develop standards and conventions for data structure and metadata management specific to a discipline's research output. Repositories should also be encouraged to explore further the use of semantic web technologies (RDF and URL-identified entity and relationship vocabularies) and linked data to leverage discovery. Emerging metadata standards will provide important improvements to access, interoperability, and use. For example, ORCID is developing a new approach to uniquely identifying researchers, and can not only enable improved discoverability and access to a researcher's publication output, but also provide improved function to institutional grant-monitoring systems and to funder review of output.

It is increasingly recognized in many scholarly communities that published research and the underlying research data on which the publication is based can and should be associated, and that scholars in the future may interact with published articles and associated research data. Thus, it is important to develop and maintain metadata specifications that are unified for both publications and research data, and recognize the relationships between these materials.

Open means of data exchange, such as APIs, are also essential to realizing the full potential of research repositories. Standard and open data exchange allows for greater interoperability, and also enables development of new resources, tools and applications built on repository contents. The EthicShare project at the University of Minnesota harvests citation data from various repositories and web resources, resolves to relevant licenses for an individual user, creating a robust discovery and collaboration environment for this interdisciplinary field. Currently, the project makes extremely productive use of information from PubMed, OAlster, and other open bibliographic resources, but is somewhat limited by the lack of public APIs for publication archives in related fields. An API requirement could facilitate the development of this project and many other non-profit and commercial tools and applications. .

(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?

One way that Federal funding agencies can maximize the benefit of public access while minimizing burdens and costs, is to standardize policy requirements, so that compliance can be streamlined across disciplines and institutions. Another way to minimize costs is to build on expertise that already exists in communities and organizations experienced with providing public access to published works. Established archives such as

PubMed Central, arXiv.org, and HathiTrust can be looked to as models for governance, infrastructure, and standards.

Tools that automate the process of depositing and distributing published research already exist and can be integrated into the workflow of authors and publishers. Excitingly, SWORD is currently exploring how best to enable deposit of research data as well as research articles.¹² Similarly, integration with grants management and researcher profile tools already in use at many institutions would ease burdens on grants-receiving institutions, while enabling greater transparency and accountability for federal research funds and improved grant reporting to funding agencies.

(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?

Publications resulting from federally-funded research that do not take the form of scholarly journal articles often convey equally valuable information and knowledge. All researchers should be encouraged to make the results of their research freely available as soon as possible after publication in order to realize the greatest possible public benefits. However, the processes for distributing non-article publications differ in fairly significant ways from the processes for distributing scholarly journal articles, and are even less uniform across disciplines. For these reasons, the full implications of a public access policy for these kinds of peer-reviewed publications are as yet unclear. Conference proceedings do usually resemble journal publications, but often present research at a more nascent stage of development than articles. Many conference proceedings are already made publicly available, so it is clear conference proceedings are not inherently unsuitable for open access, but more flexible provisions, perhaps based on date of final publication rather than date of presentation, might need to be adopted.

Monographs have a slower publication cycle, and sometimes remaining commercially saleable for several years. Rights ownership and remuneration are also often dealt with differently in monograph publications, and individual authors may have direct economic interests in their own monograph publications. There have been few systematic efforts to ensure public access to the full text of newly-published scholarly books, so the economic implications of doing so are not well understood. However, several authors, such as Harry Lewis, James Boyle, and Ted Striphas have made their monographs available simultaneously in commercial print publications and via free electronic copies with good success. Studies of scholarly monographs released under similar hybrid commercial print/free electronic distribution models have not conclusively shown any consistent harm to sales, and in several cases it appears that the free electronic copies have in fact driven sales of print copies.¹³

Of course, the benefits of providing public access to research are not limited to direct profits. The National Academies Press has been experimenting with providing free public access to electronic versions of its publications for years, and this past summer announced that from now on, all books published by NAP will be available as free PDFs. Their intention of this program is to widen the distribution and increase the impact of

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¹³ Hilton, J., III, & Wiley, D. (2010). The Short-Term Influence of Free Digital Versions of Books on Print Sales. *Journal of Electronic Publishing*, 13(1). Retrieved from <http://dx.doi.org/10.3998/3336451.0013.101>

NAP-published research, with an avowed goal of increasing downloads from 700,000 per year to over 3 million in 2013.¹⁴ For this non-profit publisher, the increased access to and use of the materials they publish is a clearly beneficial effect.

(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? 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?

Scientific research is most valuable when it is available for other scientists, innovators, entrepreneurs and businesses to learn from and build upon in a timely manner. The sooner publications are made publicly accessible, the sooner the information therein can be put to use. We advocate for immediate public access, but in no case advocate for a general embargo period longer than twelve months from publication.

The NIH public access policy allows for a twelve-month embargo period, and has not been shown to have significant detrimental effects for publishers in the field. Libraries, institutions, and organizations with a timely need for these publications still pay for early access – but organizations whose budgets cannot support paid access are still able to access the research. Many publishers have adopted shorter embargo terms (the *New England Journal of Medicine* and many other biomedical publications make all their contents freely available after six months¹⁵) without apparent harm. Certainly shorter embargo terms would be a good thing for researchers hoping to increase the reach and impact of their research, for individual taxpayers researching a health condition affecting their families, and for workers and researchers at institutions who cannot subscribe.

It is possible, though not proven, that embargo terms shorter than a year could have an impact on publisher profits. However, publishers have not demonstrated any harm from current embargo periods of twelve months or less, and many publishers have voluntarily adopted shorter embargo periods. Moreover, publishers are but one of many stakeholders in the systems of scholarship and scientific exploration. The impact of embargo terms cannot be measured solely by hypothetical damage to publisher revenues, but also by the value that free access creates for other stakeholders.

¹⁴ National Academies Press. (June 2, 2011). National Academies Press Makes All PDF Books Free to Download. Retrieved from <http://www8.nationalacademies.org/onpinews/newsitem.aspx?RecordID=06022011>

¹⁵ *About NEJM Past and Present*. <http://www.nejm.org/page/about-nejm/history-and-mission>