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Mr. Chairman, members of the Subcommittee, thank you for this opportunity to present the views of the Committee for Economic Development's (CED) Digital Connections Council on the important issue of public access to the results of federally funded research.

CED is a non-profit, non-partisan business-led public policy organization. For nearly 70 years CED has provided sound policy research on major economic and social issues facing the nation. The membership of CED is made up of some 200 senior corporate executives from a wide range of industry sectors as well as leaders from U.S universities. To address cutting edge technology issues, particularly those arising from the emergence of the Internet, CED established its Digital Connections Council (DCC) composed of information technology experts from CED-affiliated companies.

Since 2004 I have directed the DCC which has published a series of reports focusing on the impact of the Internet and the increasing digitization of information. These two developments have greatly broadened access to information and fostered a new culture of participation in which everyone can be a publisher and information can be remixed, repurposed and redistributed; they have also raised difficult new policy challenges. In order to develop policy positions responsive to this new environment the DCC has studied the special nature of digital intellectual property as well as the lessons learned from the growth of open standards, open source software, and what has become known as "open innovation."¹ Applying what it learned from these two studies the DCC then examined the impact of greater openness made possible by increased access to information as well as a heightened ability to make use of this digital information in different ways on two key sectors—health care and higher education—that depend heavily on information.² My testimony today draws heavily from these four studies which can also be found at my website www.emaxwell.net.

THE MEANING OF OPENNESS

The DCC's studies attempted to better understand what people have meant by openness, a word used in many different policy contexts—open standards, open source, open innovation, open spectrum, open access, etc. The reports eventually defined openness as a continuum ranging from closed to open on which information, processes, and even institutions could be placed depending on how accessible and responsive they were. At the closed end of the continuum, for example, is information that is not shared; somewhat more open is information only available to subscribers but which cannot be repurposed. At the other end is information posted on the World Wide Web available to all to be used without any restrictions.

THE BENEFITS OF GREATER OPENNESS

The DCC eventually concluded that movement toward greater openness facilitated by the Internet and the digitization of information was beneficial although it was necessary in each particular case to try to determine the appropriate degree of openness to achieve a particular purpose. As the most recent DCC report on openness in higher education put it, "Over the course of our work we have found that greater openness fosters quicker and broader innovation, primarily because of the potential for many more people to contribute, as opposed to having to

rely on the work of a lone “genius” or the capabilities of a very small group. Individual creators certainly play an important role. Their value should not be underestimated. But openness taps the potential of a much larger number of potential creators, who might see the problem in a different way or be aware of alternative solutions and who are able to contribute drawing upon their own experience and expertise.”³

In its report on open standards and open-source software the DCC gave a concrete example of how greater openness can be beneficial. In proprietary software the source code is concealed. In open-source software the source code is completely open. The difference between the two practices can be seen in an aphorism of the open-source software community: “With enough eyeballs, all bugs are shallow.” In seeking to continuously improve open-source software such as LINUX, the open-source community distributes the source code as broadly as possible. Even the intellectual property licenses used by the open-source community are designed to increase (and preserve) the accessibility of the code for everyone.

The rationale is that the more people who view the source code, the more likely it is that someone, somewhere, will have the expertise, experience, and inclination to detect and fix the inevitable errors (or “bugs”). Broad distribution makes it more likely that the unknown programmer for whom the bug is “shallow” will encounter the source code and suggest improvements. Making the source code accessible, rather than controlling it and excluding others from access to it, as is done with proprietary software, is necessary because the programmer for whom the bug is shallow cannot always be identified in advance.

It is clear that greater openness can sometimes be problematic. For example, health care can be improved by using electronic health records “open” enough to be accessible to all those providing care to a patient but not open to his or her landlord or employer. Similarly while greater openness increases access to information it also can create a tsunami of information that must be sorted to find the information that is actually valuable. But it should be noted, particularly in the context of today’s hearing, a belief in the virtue of greater openness is not inconsistent with support for intellectual property rights which provide a certain degree of control for the rights holder to “close” the information in order to create an incentive for acts of creation. Many of CED’s member companies rely heavily in their businesses on intellectual property.

INCREASING PUBLIC ACCESS TO FEDERALLY FUNDED RESEARCH

Given the conclusion that making research more broadly and quickly available increases its speed and breadth of discovery, it is not surprising that the DCC has supported the present NIH public access policy and its extension to other federal agencies. In its 2009 report the DCC found that:

“Congress has greatly advanced openness in research by passing legislation that dramatically increases access to research funded by the National Institutes of Health (NIH). ... This policy is being vigorously opposed by publishers who claim that their intellectual property (IP) interests are being infringed by the open access requirements. Not only do we believe that the NIH policy is consistent with copyright law and good public policy—to increase the pace of innovation and

avoid making the taxpayer pay twice for taxpayer-funded research—but we believe that the public-access mandate should be expanded. Recently introduced legislation would extend public access to research funded by the 11 federal agencies that each provides more than \$100 million in support. We also support increasing access to data collected by the government such as for regulatory purposes. The National Science Foundation has already moved in this direction by establishing a policy that any scientific and engineering data funded by NSF must be made broadly available and useable.”⁴

Supporting the DCC’s view in favor of promoting access to publicly funded research is a 2007 OECD report on public access to research data from public funding, which notes the benefits of improved access to, and sharing of, such data because it:

- Reinforces open scientific inquiry,
- Encourages diversity of analysis and opinion,
- Promotes new research,
- Makes possible the testing of new or alternative hypotheses and methods of analysis,
- Supports studies on data-collection methods and measurement,
- Facilitates the education of new researchers,
- Enables the exploration of topics not envisioned by the initial investigators, and
- Permits the creation of new data sets when data from multiples sources are combined.⁵

The OECD Recommendation, citing a U.S. National Research Council Report, states: “The value of data lies in their use. Full and open access to scientific data should be adopted as the international norm for the exchange of scientific data derived from publicly funded research.” Open access should be “easy, timely, user-friendly, and preferably Internet based.” Such a regime, according to the OECD Recommendation, not only “helps to maximize the research potential of new digital technologies and networks, but provides greater returns from the public investment in research.”⁶

In addition to the reasons set out in the OECD recommendation there is some intriguing research that suggests that billions of dollars of additional economic activity can be generated by making research more openly available.⁷

BARRIERS TO PUBLIC ACCESS TO FEDERALLY FUNDED RESEARCH

The current NIH policy—and the proposed legislation, if enacted—would dramatically reduce barriers that the public faces in gaining access to the results of research that the public funds.

The most important barrier is cost. The costs of subscriptions or licenses have been rising, putting them out of the reach of many subscribers. Prices for subscriptions have climbed four times faster than the rate of inflation in the recent past, increasing some 300 percent over the last twenty years, leading some institutions to cut back on their subscriptions, thus reducing access to cutting edge research results. In addition, researchers who do not have access to institutions that continue to subscribe or have licenses for publications are similarly without access. If

researchers do not have access to the results of others' work, it is far more likely that they will duplicate it, and it is a certainty that they cannot build upon it.

A second barrier is that journals are increasingly providing electronic versions under license. These licenses may cut off a subscriber's access immediately and even limit access to older collections, including some, but not all, of the journals that had previously been available, and prevent researchers from transferring journals to new institutions if they change employers. One other barrier is likely to reduce the impact of publicly supported research. As the DCC report on openness in health care points out, the intellectual property rights that protect the content and underlying data of many journals prevent those researchers who do have access from doing what researchers are most skilled at—adding to, revising, modifying, repurposing, and reusing the content to generate new knowledge. Some of these actions might be possible under today's intellectual property rules, but researchers without access to underlying data may be prevented from making use of new and powerful computational techniques such as machine aggregation and manipulation of data.

In launching the Public Library of Science's open-access journal *PLoS Biology*, Patrick Brown, Michael Eisen, and Harold Varmus explained why they believed they were making the information they would publish more valuable:

Freeing the information in the scientific literature from the fixed sequence of pages and the arbitrary boundaries drawn by journals or publishers—the electronic vestiges of paper publication—opens up myriad new possibilities for navigating, integrating, 'mining', annotating and mapping connections in the high-dimensional space of scientific knowledge. Consider how the open availability and freedom to use the complete archive of published DNA sequences in the GenBank, EMBL, and DDBJ databases inspired and enabled scientist to transform a collection of individual sequences into something incomparably richer.⁸

Research also suggests that a broader, more cross-disciplinary audience uses open-access materials. This is particularly encouraging because research has found that scientists working together with those in different fields are more likely to solve scientific problems. And if other researchers have access to data underlying the articles they read, they may provide a means superior to traditional peer review for replicating research and detecting fraud or identifying scientific problems.⁹

THE IMPACT OF THE PROPOSAL ON PROPRIETARY PUBLISHERS AND UNIVERSITY PRESSES

Changes in the Marketplace

There is little doubt that recent developments in the conduct of research are having a profound effect on scholarly journals and university presses. More important than the NIH public access policy or the proposed legislation has been the growing acceptance of immediate disclosure of

research results via the Internet—as in the Human Genome Project; instead of waiting weeks and months for publication in a prestigious journal many researchers have come to the conclusion that their research will have greater impact and increase the pace of scientific discovery if it is quickly disclosed allowing other researchers to build upon it. At the same time the rise of open access journals—peer reviewed journals available to all online—with very different business models has contributed to the upheaval in the existing marketplace for scholarly communications. A commitment to rapid release of research results and the Internet's existence as a vehicle for such release, combined with public access mandates, is challenging scholarly journals in much the same way as the existence of citizen journalists and the Internet's availability is challenging traditional print news media and the direct distribution of their music by independent bands is challenging the traditional music industry.

The Response of Proprietary Journals to Changes in the Marketplace

As in the newspaper and music businesses the challenges have led to a variety of creative responses. About 30 proprietary journals have become open-access journals. Some proprietary journals have voluntarily reduced the period of exclusivity during which only subscribers can have access to the published research; the *Nature* publishing group has adopted a six-month restricted window. Other proprietary journals have made their back issues freely available.¹⁰ The second largest proprietary scientific and technical publisher has become the largest open-access journal publisher by purchasing the open-access journal BioMedCentral.

Some proprietary publishers have embraced the NIH public-access policy; some have even announced their intentions to deposit articles that they publish into PubMed even though the articles are not formally covered by the policy. In contrast, the American Psychological Association initially proposed charging authors subject to the NIH policy \$2500 to deposit their articles in PubMed; the association withdrew the proposal after considerable criticism.¹¹

The variety of responses of proprietary journals suggests the vibrancy of the marketplace. Just as the music industry began to adopt digital delivery in the face of challenges by Napster and others—think of the billions of iTunes tracks and millions of iPods sold—proprietary journals are finding new and better ways to serve their audiences. The period of exclusivity provided by the NIH public access policy attempts to take into account the interests of publishers and allows them to experiment with new business arrangements while at the same time recognizing the power of broad access to information to quicken discovery; public policy should not be used to protect particular business models but should focus on accomplishing larger social goals such as fostering innovation.

Public Access and Universities Presses

In its most recent report on openness in higher education the DCC also examined the future of the university press. In the past, the university press served as a vehicle for the dissemination of scholarly work which might not have sufficient commercial appeal to be otherwise published, including the monographs that junior faculty produce, in part, to get tenure. The scholarly press was an important part of the academic ecosystem.

The ranks of university presses have thinned over time. They are expensive to operate and few have the necessary economies of scale. They are now facing threats similar to those faced by

proprietary scientific and technical publishers, particularly from the posting of scholarly work online.

Some university presses are reacting much like commercial publishers. The Princeton University Press, for example, has complained about the unauthorized posting of its copyrighted materials on the Web and, like commercial publishers, has filed copyright “take-down notices” with those hosting the disputed materials seeking to have the materials removed from public access.¹²

Such actions might be more easily justified if the university press provided substantial financial support to its host institution. On the other hand, take-down notices appear at least arguably inconsistent with the mission of the university to further the dissemination of knowledge, especially when one compares the access provided by even the most accomplished university press with the global access made possible when digital materials are made freely available on the Web.

It seems clear that universities and their presses will have to adjust to a future in which scholarship is delinked from print publication.

Alternative models are being developed. Some presses are going completely online. Some are attempting to achieve financial stability through the sale of subscriptions to their restricted websites. A different model is being developed by Rice University Press and other members of its university press consortium that are embracing openness and Internet distribution but also providing inexpensive on-demand printing services for those who want open educational resources (OER) in hard copy. The University of Michigan press has announced that it will provide on-demand printing of over 400,000 out-of-publication books digitized by Google. The National Academies are providing free digital access to over 4,000 Academy reports. Indiana University has recently proposed an infrastructure for digital publishing that could be shared by colleges and universities and that could provide economies of scale for journals, universities presses and non-profit societies.¹³

As with proprietary journals university presses are in a period of transition with old models threatened and new models emerging to be tested in the marketplace. The DCC believes that the university press will continue to play a role in the support and dissemination of scholarly work but that it should do so in a way that is consistent with the university’s historic mission to create and disseminate new knowledge as broadly as possible.

Public Access and the Potential Reduction of Support of Research

Another argument raised against open-access publishing and public access requirements generally is that it will eventually reduce the volume of research as publishers, particularly learned societies, will reduce or eliminate their publishing activities. In addition, many learned societies depend on journals to support their other activities and might be forced to find other revenue streams or cut back their activities. As to the first point the DCC noted in its most recent report that it is hard to believe that research good enough to be published in learned society journals will not find another outlet particularly when self publishing via the Internet remains as an option. While learned societies play an important role in the academic ecosystem, providing support for their other activities is an issue they must address directly; public policy to restrict the broad disclosure of publicly funded research would be an inappropriate way to address this issue.

PUBLIC ACCESS AND INTELLECTUAL PROPERTY RIGHTS

Some proprietary publishers, including scholarly societies and universities presses, have attacked the NIH public-access policy. They have protested the mandate on the grounds that it violates U.S. copyright law by forcing authors to give up part of their copyrights prior to later transfer to a publisher. Some have also supported legislation—the Fair Copyright in Research Works Act—which would overturn the NIH mandate.

The DCC is not a body whose expertise lies in interpreting U.S. copyright law. However, based on a review of responses to NIH's requests for comments on its public access policy, the DCC has stated its belief that the policy is consistent with U.S. copyright law.

An author's copyright consists of a bundle of rights that belong to the author. One or more of these rights can be transferred on a voluntary basis by the author. Under the NIH public access policy researchers who conduct research and report on that research agree, in return for public funding for their research, that they will grant NIH a license to make the researcher's final version of the report publicly accessible within 12 months of publication. This kind of agreement is the same kind of agreement that authors enter into with other entities that fund the creation of copyrighted work—such as authors who receive an advance from a commercial publisher. Any party that funds a researcher's creation of a copyrighted work could require some agreement with the researcher about the disposition of some or all of the bundle of rights belonging to the researcher in exchange for such funding.

Unlike commercial publishers who generally seek an exclusive license of rights in return for advances and/or the promise of future royalties, NIH, or another government research funder, only requires the grant of a non-exclusive license leaving the researcher free to transfer any or all of his or her rights to a journal publisher or anyone else. The researcher could voluntarily provide a non-exclusive license to the final version to anyone else, with or without compensation, without compromising the rights which a journal publisher requires in order for the publisher to be able to publish the results of the research.

Another argument that has been made is that the public access requirement might violate U.S. obligations under various intellectual property treaties to which the U.S. is a signatory. These treaties deal with copyright laws and limitations and exceptions to such laws. But these treaties do not apply to contracts in which a researcher agrees to voluntarily provide non-exclusive licenses to his or her work in exchange for funding. Moreover it is traditional U.S. procurement policy that when a federal agency enters into a contract that would lead to the creation of intellectual property that the agency must reserve a license to use such intellectual property.

It should be noted that a number of other research funders, public and private, have amended their funding contracts to require, as a condition of support, that authors make their work publicly accessible through deposits into online digital repositories. The U.K Medical Research Council, the European Research Council, the Canadian Institutes of Health Research, among others, have adopted such policies and provide a 6 month window of exclusivity for the publisher before the deposits are made publicly accessible.

In a related development, based on the same belief that broad dissemination of research results fosters the creation of knowledge and prevents redundant research, the MIT faculty unanimously agreed to require that the results of MIT research be deposited into an open-source digital repository to be available to all; while individual authors can block public access to the results the fact of the existence of the research is available so that interested parties can seek access directly from the author. Other leading institutions of higher education have adopted similar policies.

OTHER POTENTIAL ACTIONS TO FOSTER GREATER OPENNESS

The DCC fully supports greater public access to publicly funded research. In its four reports the DCC has also made a series of other recommendations for governmental actions that would allow the U.S. to benefit from the potential for greater openness. I would like to highlight some of these recommendations and encourage the Subcommittee to explore the possibility of legislation that would implement them. They all share a common goal of increasing public access to information and allowing the public to make creative uses of information. These recommendations include:

- Extending the public access policies, under appropriate conditions, to primary data gathered pursuant to publicly funded research and to data submitted in support of governmental regulatory activities. One area of critical importance is access to data underlying clinical trials submitted to the FDA as part of the approval process for drugs and medical devices; this data is sometimes withheld for years being considered “trade secrets”. Recent discoveries of potential dangerous side effects of approved drugs based on data submitted as part of the approval process show the importance of such access.
- Requiring data that is gathered pursuant to publicly funded research and data submitted in support of governmental regulatory activities to be in a form that is searchable and computable using common standards so as to maximize the utility and “responsiveness” of the data.
- Requiring federal agencies that fund research to review their granting guidelines to take into account the research accomplishments of potential grantees who choose to promptly disclose the results of their research and who may therefore forego publication (as the work is deemed by some publishers as already “published”). These agencies should explore alternative mechanisms for determining scholarly achievement beyond traditional scholarly publication in awarding grants and other awards.
- Encouraging federal funding agencies to be receptive to requests for funding for the publication/disclosure of research results in open access journals that utilize an “author pays” funding model.
- Improving access to so-called orphan works—those still under copyright but whose rights holders cannot be reached—by legislatively permitting “good faith” use until receiving a valid “take-down” notice or by limiting liability for “good-faith” use until a valid “take-down” notice is received.

- Supporting efforts to establish compatibility, comparability, and transparency regarding degrees and certificates that are acquired utilizing federal student grants or loans.
- Encouraging accrediting agencies for institutions of higher education that are recognized by the federal government to make more information available about the institutions that they accredit in order for students to make better choices about where to apply and matriculate.
- Encouraging colleges and universities which obtain patents based on federally funded research to consider the longer-term benefits of non-exclusive licenses and the benefits of wider dissemination of knowledge.

Thank you again for the opportunity to offer this testimony and to support greater openness through increasing public access to publicly supported research.

¹ Committee for Economic Development, *Open Standards, Open Source, and Open Innovation* (Washington, D.C.: CED, April 2006), available at http://www.ced.org/images/library/reports/digital_economy/report_ecom_openstandards.pdf; Committee for Economic Development, *Promoting Innovation and Economic Growth: The Special Problem of Digital Intellectual Property* (Washington, D.C.: CED, March 2004), available at http://www.ced.org/images/library/reports/digital_economy/report_dcc.pdf.

² Committee for Economic Development, *Harnessing Openness to Transform American Health Care* (Washington, D.C.: CED, 2008), available at http://www.ced.org/images/library/reports/digital_economy/report_healthcare07dcc.pdf; Committee for Economic Development, *Harnessing Openness to Improve Research, Teaching and Learning in Higher Education* (Washington, D.C.: CED, 2009), available at http://www.ced.org/images/library/reports/digital_economy/dcc_opennesedu09.pdf.

³ Committee for Economic Development, *Harnessing Openness to Improve Research, Teaching and Learning in Higher Education* (Washington, D.C.: CED, 2009), available at http://www.ced.org/images/library/reports/digital_economy/dcc_opennesedu09.pdf.

⁴ Ibid.

⁵ Organization for Economic Cooperation and Development, "OECD Principles and Guidelines for Access to Research Data from Public Funding," 2007.

⁶ Ibid.

⁷ Michael Geist, "Push for Open Access to Research," BBC News, February 28, 2007, available at <http://news.bbc.co.uk/go/pr/fr/-/2/hi/technology/6404429.stm>.

⁸ Tim Hubbard and James Love, "Paying for Public Goods," in Rishab Aiyer Ghosh, ed., *Code: Collaborative Ownership and the Digital Economy* (Cambridge: MIT Press, 2005), pp. 207-229.

⁹ Karim R. Lakhani and others, "The Value of Openness in Scientific Problem Solving," Working Paper 07-050, October 2006, available at <http://www.hbs.edu/research/pdf/07-050.pdf>.

¹⁰ "Nature Publishing Group Launches Manuscript Deposition Service," *Nature Press Release*, July 30, 2008, available at http://www.nature.com/press_releases/depositionjuly08.html.

¹¹ "Clancy Ratiff, "Open Access in 2008: The Harvard Policy and the APA's Attempt to Profit from the NIH Open Access Mandate," *Conference on College Composition and Communication*, April 2008, available at <http://www.ncte.org/cccc/committees/ip/2008developments/openaccess>.

¹² Scott Jaschik, "Pirates vs. University Presses," *Inside Higher Ed*, February 18, 2009, available at <http://www.insidehighered.com/news/2009/02/18/pirate>.

¹³ Indian University Digital Library Program, "About Us: Overview of the Digital Library Program," May 2009, available at <http://www.dlib.indiana.edu/about/index.shtml>.