

**TESTIMONY OF ELLIOT E. MAXWELL BEFORE
THE SUBCOMMITTEE ON INVESTIGATIONS AND OVERSIGHT OF THE
COMMITTEE ON SCIENCE, SPACE AND TECHNOLOGY
THE UNITED STATES HOUSE OF REPRESENTATIVES
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Mr. Chairman and members of the Subcommittee,

First let me express my appreciation for the opportunity to testify today. The interest of the House Science Committee in this area is longstanding and deserves commendation. I am honored to be invited to share in the efforts to ensure that the taxpayers of this country obtain the greatest possible return on their investment in federally funded research.

My testimony today is based on a report, "The Future of Taxpayer Funded Research: Who Will Control Access to the Results?" which I wrote under the auspices of the Committee for Economic Development (CED) with generous support from the Ewing Marion Kauffman Foundation. That report addresses the costs and benefits of the public access policies of the National Institutes of Health (NIH) as well as proposals to overturn or extend that policy; it does not analyze or make recommendations regarding particular legislative proposals. I would ask that a copy of this report be included in the hearing record.

I should make clear that I am testifying as the author of the report but do not speak for CED or any of its members or funders; the opinions I express today are my own. The Ewing Marion Kauffman Foundation exercised no control over the research or the findings, and neither CED nor I have any financial interest in the conclusions or recommendations.

SOME BACKGROUND ON CED AND THE DIGITAL CONNECTIONS COUNCIL (DCC)

CED is a non-profit, non-partisan business-led public policy organization. CED conducts research on major economic and social issues and actively informs and engages the business community in an effort to achieve policy reform for the good of the nation. Membership is made up of some 200 senior corporate executives and university leaders who lead CED's research and outreach efforts.

For the last several years I have served as project director of CED's Digital Connections Council (DCC), which is chaired by Paul Horn, former IBM Senior Vice President for Research and currently New York University Distinguished Scientist in Residence & Senior Vice Provost for Research. During this time CED has issued several DCC reports on how greater "openness" made possible by the digitization of information and the growth of the Internet can lead to increased benefits to society and how it can improve specific domains such as healthcare and higher education.

"Openness" as used in these reports can be thought of as a continuum from completely open--such as something posted to the World Wide Web and available to all without any restrictions--to completely closed--such as a formula written down but kept under a pillow and never shared. Openness has two aspects: accessibility and responsiveness. To the degree that information or processes are accessible--e.g. are available without need to pay a subscription or for the recipient to be at a particular place--they are more open. And to the extent that what is accessible is responsive--e.g. can be repurposed, and reused--they are more open. While achieving greater openness has many positive rewards, these reports all have stressed that careful thought should be given to determining the right degree of openness for the particular situation. Electronic health records, for example, should be open to all the medical personnel providing treatment to an individual, but not open to a landlord, and should be responsive to reports of lab test results but not alterable by anyone not authorized to do so.

The results of greater openness made possible by digitization and the growth of the Internet can be seen in the rise of open source software, the development of open educational courseware, the emergence of open innovation, the global scientific collaboration in the Human Genome Project (HGP) and the immediate announcement of its results, and, most importantly for today's hearing, the NIH public access policy which was the subject of the report on the "Future of Taxpayer-Funded Research."

SOME BACKGROUND ON THE NIH PUBLIC ACCESS POLICIES

Progress in science is built upon the work of those who came before. Demonstrations of such progress in research could be found in published scientific journals that for several hundred years have been among the most important vehicles for the dissemination of new scientific knowledge.

Until very recently modern scientific journals were funded almost entirely by institutional subscriptions; subscribers such as libraries and their users had access to new research results while others without subscription access had to wait for other means of knowledge diffusion to have access to this new knowledge. With the adoption of the NIH public access policies, an alternative and complementary model for access to NIH funded research results was given an enormous boost.

The U.S. National Institutes of Health is the largest single funder of biomedical research in the world with a budget of \$31 billion that, through its grants making process, generates 90,000 articles each year. Since 2008 NIH's public access policy has required that its grantees place a copy of their peer-reviewed manuscripts accepted for publication by a scientific journal in PubMed Central (PMC), an online digital repository open to all; the work would be available no later than 12 months after the version of record is published. In 2005, NIH had asked grantees to deposit their work voluntarily. By 2008 only a small percentage of grantees--7%--had done so and NIH made deposit mandatory, a policy decision based on instructions to NIH in a law passed by Congress and signed by the President.

PMC now includes more than 2.3 million full text manuscripts and articles and over a thousand journals now voluntarily deposit all of their articles into the database, whether or not they deal with NIH funded research. Over 500,000 unique visitors access PMC on a typical workday.

The policy has been in effect for nearly four years but there are disagreements about its impact. Supporters of the policy have argued that the increased public access has substantial positive impacts on the progress of science, innovation and economic growth, and should be extended to cover extramural research funded by other major federal funders of unclassified scientific, technical, and medical (STM) research. Opponents, primarily but not entirely, publishers of proprietary STM journals, have argued that the increased public access has or will damage their subscription supported publishing businesses and, by so doing, will undercut the peer-review system. They have stated that the financial pressure may force publishers to close, and as a result, reduce the amount and quality of research by reducing the number of outlets for research, while at the same time undercutting their copyright interests. Publishers also argue that the manuscripts authored by researchers are not the direct result of the NIH funding and that NIH should be making public the reports filed by grantees pursuant to federal regulations.

SOME BACKGROUND ON THE "THE FUTURE OF TAXPAYER-FUNDED RESEARCH; WHO WILL CONTROL ACCESS TO THE RESULTS?"

CED initiated the report because the differing assertions about the impact of the NIH public access policy and the different proposals to extend or overturn it raised important public policy issues and were related to earlier efforts by the DCC. Unlike the debates over the policy around the time of its adoption, there were now nearly four years of experience with the policy on which to base conclusions.

I'd like to make one point absolutely clear. The report is focused on the question of how the NIH public access policy, and its potential extension to other federally funded extramural research--or its reversal--might affect the development and dissemination of high quality scientific research and its benefits to our society.

The impact of the policies on proprietary publishers (for profit or not for profit) or open access publishers (publishers that rely on author payments rather than subscriptions) digital repositories or any particular means of disseminating knowledge was important (for the purposes of this analysis) only in so far as the impact would affect the development and dissemination of high quality research. This focus was chosen because the impact of the policy on the production and dissemination of knowledge is the central issue and of high public importance given the very substantial taxpayer expenditures in support of research and the enormous public benefits that can be gained from that research.

The report does not dwell on the fundamental importance of research to innovation and economic growth; that case has been made well by generations of economists, scientists, and others and is supported by both proponents and opponents of the NIH public access

policy. The report does look at the costs and benefits of increased public access to research results through the lens of "openness" with a particular interest in how greater public access (and greater openness) affects progress in science, the productivity of the research enterprise, the process of innovation, the commercialization of research, and ultimately economic growth.

THE SHARED AGREEMENT ON THE ISSUE OF INCREASED PUBLIC ACCESS

It is worth noting that all the parties involved in the debate about the NIH public access policy support the concept of greater public access to the results of scientific research. Even opponents of the policy who believe that there is not a current problem with public access which would justify public policy intervention have argued that they are already making changes to increase public access where there might be a problem, for instance with regard to patients and others interested in the literature on a particular medical condition, or for scientists from less developed countries who could not afford to pay current subscription rates. So, increased public access is, by all accounts, of benefit to the society absent some compelling cost or other counter argument.

It is also worth stressing that no one disputes that the NIH public access policy has already substantially increased public access to the results of NIH funded research from what was previously available from traditional STM publishers.

THE BENEFITS OF INCREASED PUBLIC INTEREST

While all parties agree that increased access is of benefit, it is important to understand exactly why it is beneficial. The report examined this question and reviewed the most current literature to see what could be learned. The report found specific benefits in four major areas:

Increased public access accelerates progress in science by speeding up and broadening diffusion of knowledge. This was of some benefit to researchers in the field covered by a journal allowing them to get to the frontiers of knowledge more quickly. But these researchers in a field were more likely to have access through subscriptions as they constitute the target audience for the journal. But increased access benefited others who do not have equally good access to recent research results such as researchers in the field at less well resourced institutions, researchers in other fields, clinicians and patients, and those in the general public who are able to contribute to scientific and technological development. The report noted, in particular, the benefit of access to those in the private sector developing new goods and services who rely on access to scientific research and who report considerable difficulties obtaining access. (The report provides ample evidence of the lower levels of access experienced by such groups and the problems that they encounter without access such as provided by the NIH public access policy.)

Providing better access to this expanded group of readers has important benefits. As Fiona Murray of MIT and her colleagues have pointed out, expanding access increases the number of, and the diversity of, potential follow-on researchers.

This leads to the exploration of a larger number and a wider variety of research paths and experiments to find solutions, increasing the likelihood of success. Increased public access which leads to more and more varied follow-on research also leads to faster movement from basic research to applied research.

Heidi Williams, also of MIT has shown, in her study of the competition between Celera Corporation and the Human Genome Project to decode the human genome, that providing increased public access to research results--as practiced by the HGP--not only resulted in more follow on research but in faster commercialization of the research through new products and services. (The 30% gains in follow-on research and commercialization attributed to the openness of the HGP process persists even today.) More follow-on research and faster commercialization increases economic growth and creates new jobs.

The report includes substantial research demonstrating the positive economic benefits of increased public access under very conservative assumptions.

Research results which are made more publicly available generate more follow on research and more citations in future articles. This is an important benefit to the authors of the manuscripts that are made available. The processes for academic advancement--e.g. tenure and promotion decisions--recognize citations in follow-on research as indicators of the quality of the research. (The report did recommend that these same processes need to be reexamined in order to reward researchers who increase public access to their work by early disclosure of their findings or by sharing new tools and processes. It further recommended that federal agencies recognize such contributions to the progress of science in making grant decisions and in selecting grant panels, etc.).

Increasing access to research results also increases the efficiency of the research enterprise. It helps researchers to locate past research and avoid duplicative or dead end lines of inquiry. It also facilitates the continuing evaluation of research, helps promote accountability for funders, and better administration of the research enterprise allowing a sharper focus on research priorities.

In all of these ways increasing public access promotes the maximum return on the taxpayer's investment in research. Moreover, taxpayers are not asked to pay twice for the same research, first through government grants and then again to obtain access to the results through subscriptions.

IF ALL THE PARTIES AGREE THAT INCREASING PUBLIC ACCESS IS BENEFICIAL, AND IF THE REPORT AND RECENT RESEARCH DEMONSTRATE THE SIGNIFICANT VALUE RESULTING FROM INCREASED PUBLIC ACCESS, ARE THERE DEMONSTRABLE NEGATIVE EFFECTS WHICH OUTWEIGH THIS VALUE?

In doing the research that led to the report we reviewed all the public filings and testimony provided by those who opposed the NIH public access policy and who claimed

that it had or was likely to cause substantial damage. We were unable to find persuasive evidence of such damage even though the policy has now been in effect for nearly 4 years, having gone into effect on April 7, 2008.

We found no persuasive evidence that greater public access as provided by the NIH policy has substantially harmed the subscription supported STM publishers over the last four years or threatens the sustainability of such journals. While there have been subscription cancellations in the last 4 years, these have linked in surveys done on behalf of publishers with the impact of the recession that began in 2008. Academic institutions were hit hard by this recession and library budgets were reduced year after year. (Increased public access was cited by fewer than 5% of respondents as a contributing factor in cancellation decisions in one publisher survey of cancellations cited in the report.)

We found no persuasive evidence that increased public access substantially threatened the ability of STM publishers to fund peer review. In considering the impact of increased public access on peer review it should be noted that authors provide their manuscripts to publishers without being compensated by the publisher (other than through the fact of publication itself). Peer reviews are conducted on a voluntary basis by scholars as part of their obligations as scholars as is much of the editorial effort for STM journals.

We found no persuasive evidence of a significant reduction in traditional publishing outlets; in fact we found no evidence of any high impact proprietary journal ceasing publication for financial reasons. There are more STM journals being published today than there were when the NIH policy went into effect. Over 7500 Open Access journals have started over the last decade. There is no evidence of any shortage of outlets for the distribution of high quality research.

The best evidence of the financial status of the STM journals and of any impact from increased public access remains in the hands of the publishers. We searched public filings and testimony but we also turned to another source with strong incentives to correctly portray the financial conditions of traditional publishers--the financial analysts that cover the STM industry segment and who make recommendations to investors. The STM segment has been a traditional favorite of investors given their relatively high profit margins and their ability to continually raise prices faster than inflation. Financial analysts noted that the *growth* of profits for the STM publishers dropped from 6-7% in the first part of the last decade to roughly 4% during the recession. The general consensus over the last several years is for profit growth to increase to 5-6% as the economy recovers. Some financial analysts also reported that the STM publishers downplayed any financial threat due to policies designed to increase public access.

The report concluded that the benefits of increased public access were clear and demonstrable and that there was no persuasive evidence of costs that would outweigh the benefits and provide support for a reversal of the policy. The

cost/benefit analysis provides substantial supports for extending the policies to other federal funders of substantial extramural research.

The benefits of increased access are so great than any delay in availability of research results should be minimized to the extent practicable. A maximum six month delay, now employed by other government and private research funders has not been shown to have any negative impact in the biomedical field. Given the benefits of increased public access, those who seek delay or special conditions based on their disciplines being different from the biomedical arena should bear the burden of proof that the benefits of delay to the development and dissemination of high quality research outweigh the postponed benefits of greater public.

The NIH policy focuses on allowing users of PMC to access and read manuscripts setting out research results of NIH funded research. This policy has had substantial benefit. But the manuscript is not the only measure by which to judge increased access nor is reading an article the only goal of most researchers; in theory researchers should be able to access the manuscript and its subparts--underlying data, protocols, tools utilized for analysis etc. The return on investment in government research would, in theory, be increased to the extent the manuscript and its subparts are machine readable, subject to text and data mining and computable, capable of being displayed, linked and translated into other languages, and subject to analysis with tools chosen by the reader. The challenge will be to find the appropriate degree of openness including access to the manuscript and its subparts and being able to use what is available.

But going beyond the manuscript raises many new questions. Major issues particularly regarding unlimited use and reuse and access to data, remain. Some of these can be addressed by various stakeholders working together; others might be referred to the National Academies. There have been many initiatives in this area which should be supported in an effort to reach consensus which will enable the appropriate degree of increased openness to be determined.

Digital depositories and other mechanisms for dissemination of knowledge provide high returns on investment and should receive greater funding.

Government should work with stakeholders on standards for metadata to enable search and discovery, and standards to ensure interoperability and rules for access among repositories to guarantee access.

Government should also minimize differences among public access rules for federal agencies to promote access and decrease the cost of compliance for both public and private sector entities, particularly those entities that receive funding from multiple federal agencies.

CONCLUSION

The report analyzed the costs and benefits of the NIH public access policy and proposals to extend or overturn it based on the evidence from four years of experience with the policy. It found substantial increases in public access and substantial public benefits arising from the increased access. It found no persuasive evidence of harm to the development and dissemination of high quality research; on the contrary it found that increased public access increased the rate of progress in science by expanding follow on research and facilitating more and more varied approaches to important scientific questions and was likely to improve the efficiency of the research enterprise, increase innovation, and promote economic growth. The same logic applies to other areas of research funded by taxpayers although the particular circumstances may be different.

The digitization of information and the rise of the Internet have created a digital tornado that is sweeping through all fields of knowledge. New models for disseminating knowledge are emerging, old models are being modified, and there is little certainty as to what will happen in the future. But one thing is certain. The more people who have access to knowledge, the more likely it is that someone with the right interests and inclinations and incentives will use that knowledge to solve an important problem. We should be careful about proposing governmental actions but we should also be trying to maximize the return on taxpayer investments in research; we should also be enthusiastic about the capability of all people, experts and everyman, to use research results to make contributions to the common good.