

Scholarly Communications is Not Toxic Waste:
Lessons Learned

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I will address the ecology of the scholarly communications system. This conference focuses on dramatically improving the effectiveness of that system by creating “open access to knowledge.” In our efforts to do so we must observe the physicians’ maxim: “First, do no harm.” A little time spent focusing on system ecology and what we have learned from past perturbations in that ecology is warranted.

Germany is a most appropriate place for this exploration. Johannes Gutenberg’s western invention of the printing press about 1450 made the Renaissance possible and the printed text both possible and affordable. Martin Luther’s insistence fifty years later that the written word was not a danger to people and that the Bible and other texts should be “unchained” and made available in the vernacular is an appropriate precedent for this conference on “Open Access.” Both Gutenberg’s invention and Luther’s insistence on access disrupted the existing order in fundamental ways. Open access will similarly be disruptive to individual institutions and scholars.

The modern scholarly communications system is actually very old, nearly as ancient as the two events I just mentioned. Most scholars trace its origins to the network of clubs and societies that grew up in England, France, Germany, Italy and elsewhere during the 1600s. These societies focused on understanding the phenomena of the natural world, generally following the inductive reasoning described by Francis Bacon in *The Advancement of Learning* (1605). In 1665, the Royal Society in London began publishing the journal *Philosophical Transactions* and the society in Paris shortly followed with its own journal. Thus, formal, published scientific journals began.

The operations of these scholarly journals and all of their successors until the latter third of the 20th century have been characterized as a “gift exchanges.” This means that scholars eagerly gave their works to scholarly society journals in the expectation that they would receive works from other scholars in exchange. Thus journals throughout this period were largely operated on a non-profit basis with every effort made to keep the cost of producing the journals at a minimum so that they could be sold at minimum prices.

This system changed drastically in the 1960s and 1970s as private companies realized that the material in scholarly journals had enormous unrealized market value. This epiphany prompted them to obtain the publishing and pricing rights to existing scholarly journals from the societies and to create scholarly journals of their own. They began to price these journals to extract all the market would bear rather than pricing them by the minimal cost recovery principle inherent in the gift exchange. Unfortunately, scholarly societies too often lost sight of the founding principles of the early societies and emulated the behavior of the commercial firms. Three

decades of ruinous inflation in scholarly journal prices have resulted. Ruinous because access to the literature generated by scholars and submitted in the spirit of the gift exchange no longer resulted in receipt of scholarship in return. Increasingly, prices for access to scholarship rose more quickly than library budgets. Scholars had reduced access to their own work. The progress of science has undoubtedly been affected by this reduced access. If we do not act decisively, and soon, society increasingly will suffer because of this hijacking for profit of access to material that is crucial for social progress.

Understanding both the danger in letting this market restriction to scholarship that should be available to the public continue and understanding that efforts to correct the problems that did not take into account the ecology of the scholarly communications system would fail, the Association of American Universities and the Association of Research Libraries assembled a group of stakeholders in the scholarly communications system in Tempe, Arizona in March 2000. That group of stakeholders generated a document called “Principles for Emerging Systems of Scholarly Publishing” to guide efforts to solve the problems extant. These so called “Tempe Principles” are the distillations by this knowledgeable group of those things that must be protected if the scholarly communications system is to serve scholars well in the future. They represent what we have learned to be essential in the 350 years of scholarly journals. I offer the nine Tempe principles as criteria against which the open access proposal that is before this assembly could profitably be evaluated.

The Tempe assemblage recognized in Principle One that providing access to scholarship was critical and that rising costs had to be contained so that access could be assured. ***The cost to the academy of published research should be contained so that access to relevant research publications for faculty and students can be maintained and even expanded.*** Clearly the open access proposal provides access at minimal monetary cost.

We have learned that scholarly communications are highly sensitive to market forces on two levels. First, the volume of scholarly findings available responds to the economic support available to researchers from the public. Second, the scholarly communications submitted for publication grow as the rewards to scholars from publication of their work grow. Over the last several years the United States has doubled the budget of the National Institutes of Health and has set about doubling the budget of the National Science Foundation to produce these same ends. Many other governments have made the same investments in recent years. While there is no diminution of the respect we all hold for the private market, there is clear recognition that much progress depends on public investment in research.

There is no easy way to quantify the increase in knowledge available for publication as a result of the increased funding. It appears that there has been a doubling of the number of scholarly journals in the last twenty years and the number of articles in the annual run of most journals has also increased. It would be foolhardy not to prepare ourselves for the deluge of additional research findings that will proceed from the doubling of the NIH budget.

But it is important to understand that faculty derive monetary value from their work and that this value affects the volume of publication. The amount of scholarly communication submitted for publication has grown as the rewards to scholars have grown. Published works by labor economists on the determinants of earnings of faculty members almost universally show that the returns for increased publication are positive and very large. These findings are robust across time and discipline. They probably underestimate the returns for publication as their models include, in addition to variables that directly measure returns to numbers and quality of publications, variables that themselves are positively affected by publication rates.

Some wonder whether the incentive to publish is too much based on quantity of publication rather than on quality of publication. Indeed, those of us assembled to produce the Tempe Principles enumerated as Principle 8, ***“To assure quality and reduce proliferation of publications, the evaluation of faculty should place a greater emphasis on quality of publications and a reduced emphasis on quantity.”***

Inherent in our deliberation was whether too much emphasis on the volume of publication has artificially inflated the literature. Such inflation could be corrected by emphasizing quality through various schemes such as considering only a specified number of publications in evaluating promotion and tenure cases or funding proposals.

How is it possible that a two decade-long double-digit rate of price increase in scholarly has not created societal outrage? Is there a perception by the public that what we publish in scholarly journals is not of great value? We have all heard public figures—most often politicians—ridicule esoteric research projects. More often, too much of our published work simply does not demonstrate its own worth.

As scholarly communications move from the printed page to the electronic arena a historical brake on the volume of publication is lost; that brake is the cost of publication. During the print age, every journal editor knew approximately how many pages his journal could afford to print per year and held the volume of manuscripts selected for publication to this number. In the electronic age, the cost of accepting one more article for publication is trivial. Do we risk further trivializing the public’s view of our research with the elimination of much of the marginal cost of publication? Would open archiving cause a ballooning of publication numbers and further reinforce this public perception?

I held hope that Paul Ginsparg’s marvelous physics archive begun at Los Alamos, which has come to hold more than 70% of all the physics scholarly literature, would eliminate the pricing hegemony held by journals as it let authors distribute their manuscripts to the entire physics community without first passing through the gate-keeping function of scholarly journals. Unfortunately, my hopes have been dashed. Between 1999 and 2003, physics journals increased in price 84.4% according to the Library Journal (April 15, 2003), while the average price of scholarly journals in all fields increased by 32.9%. The availability of the literature outside of journals clearly did not diminish pricing ability because much of the value of “publication” to the author is not in its availability to the profession, but in the quality of the journal that has placed its imprint on the manuscript. Thus the flow of manuscripts to journals continued unabated and the demand by physicists that libraries subscribe to journals was also unabated, even though access to the literature was guaranteed by Ginsparg’s marvelous archive. Physicists (and the field of physics) are clearly better off because of the access provided by the archive, but the pricing hegemony of the physics journals was unaffected by this near-universal electronic free access.

The lesson in this story (at least for the discipline of Physics) is this: the free and ubiquitous availability of unrefereed manuscripts does not reduce the market demand for scholarly journals. I suspect that this observation is universally true because busy scholars place high value on the refereeing services that journals provide. Conversely, manuscripts that have not been vetted by experts are accorded little value by most readers. Again, the Tempe Principles recognized this fact in Principle 4, ***The system of scholarly publication must continue to include processes for evaluating the quality of scholarly work and every publication should provide the reader with information about evaluation the work has undergone.*** The assembled experts recognized that refereeing is a key part of the ecology of the scholarly communications system but acknowledged

that works that had not been evaluated should be made available, provided that the reading public knew that they had not been evaluated. I will return to risks to refereeing from open archives later, as the increased volume of “publication” promoted by open archives makes it critically important that a strong system of refereeing continues.

In Principle 2, the Tempe group recognized the role that electronic access could play in creating this ubiquitous access. ***Electronic capabilities should be used, among other things, to: provide wide access to scholarship, encourage interdisciplinary research, and enhance interoperability and searchability. Development of common standards will be particularly important in the electronic environment.*** We have made much progress on the road to providing electronic access meeting these criteria, thanks to the work of pioneers like Ginsparg, van de Sompel and Harnad.

But the Tempe Principles also maintained that the integrity of one’s work had to be protected and that publishers required economic incentive if they were to publish the works, thus they embraced the nearly universal legal protection of copyright. Principle 5: ***The academic community embraces the concepts of copyright and fair use and seeks a balance in the interest of owners and users in the digital environment. Universities, colleges, and especially their faculties should manage copyright and its limitations and exceptions in a manner that assures the faculty access to and use of their own published works in their research and teaching.*** This principle has a balancing mechanism built into it. All present recognized that copyright was a critical protection for the work but all also recognized that it was the assignment of all copyright to publishers that permitted the unrestrained price increase of scholarly journals that resulted in limited access to the academy of the works which its own members generated. Thus principle 5 was both reinforced and counterbalanced by principle 6: ***In negotiating publishing agreements, faculty should assign the rights to their work in a manner that promotes the ready use of their work and choose journals that support the goal of making scholarly publications available at reasonable cost.***

In my view, the call for the provision of a free, electronically accessible copy of a scholar’s work available on web sites should not be equated to a call to abandon copyright. The earliest scholarly journals did not have copyright, as we know it today, to protect them. The financial viability of the journals was often threatened, as the more popular works they published were soon made available in commercial presses. The publishers found it necessary to bind authors contractually in order to provide the sole publication rights that enabled them to be commercially viable. Authors often found that in the absence of copyright their words or close abridgements of them appeared under the names of other authors and they had little recourse. Copyright laws provide a means of protection for an author and provide a somewhat more efficient means of security for publishers than did contractual agreements with authors.

While complete surrender of copyright to publishers is clearly the core enabler of scholarly journal price inflation, we should not strip copyright from authors or publishers as the proposed law offered by U. S. Congressman Sabo would do for works arising out of U.S. federally- funded research. Authors would soon find that one of the rights lost with the copyright is the right to modify one’s work. One might find work published without copyright had been modified to say things the author never intended. The original author might well be acknowledged as providing the base work that the subsequent author modified, but the modification might be such a perverted version of the original work that the first author would not want credit or acknowledgement of any sort. It would be far better to maintain copyright of the original work so that modification of it can be legally constrained. Occasionally, an author or a publisher wishes to generate a volume containing the author’s collected works. Publishing such a work is

dependent on the generation of an economic return. Publication of collected works would surely stop if there were no copyright. Another publisher, eliminating or drastically reducing the economic return to the first producer, could immediately reprint such a collection. There are many other dysfunctions that arise from loss of copyright that I will not detail here.

It is clearly important that the copyrights be preserved but that the rights of access to scholarly material are also guaranteed. I believe that the two conditions set for open access contributions in the proposed Berlin Declaration are consistent with the principles of copyright. By meeting the conditions authors are not relinquishing their right to prohibit unauthorized uses of their material.

I am concerned that the proposed Berlin Declaration's open access/open archives may reduce the financial incentive of journals to referee, edit and publish scholarly communications, perhaps so much that the survival of journals is threatened. At present, many publisher prohibit the publication of a manuscript in an electronic form even on the author's publicly accessible server. According to Stevan Harnad's mass e-mail of October 5, 2003,

Most journal publishers accordingly support open access. 500 (out of the total of the world's 24,000 peer-reviewed journals) do so by being or becoming open-access journals: <http://www.doaj.org/>

Of the remaining journals, 55% of the Romeo Project's sample of the top 7135 are already "green," i.e., already explicitly support open access by supporting the author self-archiving of either preprints or postprints or both." <http://www.lboro.ac.uk/departments/ls/disresearch/romeo/Romeo%20Publisher%20Policies.htm>

My concern is not with the Project Romeo data but with the behavior that might occur if scholars *en mass* signed on to open archives and journal subscriptions began to fall dramatically as a result. Even "green" publishers might reverse their current policies on open archiving and establish firm requirements that authors not place their manuscripts on the web at all.

While I observe that open archiving of physics materials has not resulted in falling journal prices, I believe that open archiving would result in falling prices were essentially all scholarly material available immediately on the web for free. Under that circumstance, librarians and scholars would regard subscriptions as superfluous. If subscriptions were dropped, the economics of journals would be threatened. Publishers would react by thwarting open archiving. One counter to such action by journals could be an authors' boycott of such journals until they reversed their policies. I am not optimistic about the results of such collective action, as the boycott promoted by Public Library of Science produced little fruit in spite of having gained the signatures of 30,000 scholars.

An alternative to subscription support of journals would be to fund journals from sources other than subscription fees so that they could continue as open access providers. Foundations and government funding agencies are possible sources of such support as are submission or publication fees paid by authors or their universities. However, we should not underestimate the danger of having government entities or foundations as direct funders of research publications. Journals with this kind of supported would inevitably be suspect. Can one imagine a U.S. government-funded journal publishing a piece on the efficacy of stem cells while the Bush administration is in office? Perhaps journals could be insulated from such concerns but the funding source would always create suspicions. I am aware that many such journals exist throughout the world but the fact that there are truly independent journals provides both an alternative source of scholarship and a check on the political influence that might be placed on the

government-supported journals. Most foundations are known to have a “point of view,” so the reservations I have about government funding of research publications apply to foundations, as well.

Alternatively, the Bethesda declaration provided that open access journals would be funded with fees assessed on authors or their universities, not on subscription fees. Both the Wellcome and the Hughes Foundations have indicated that they will pay these fees to support submissions to journals that are “open access.” I believe there are serious drawbacks to such funding mechanisms.

- First, such funding mechanisms do nothing to control the rate of increase of submission fees that might be charged by the journals. In an environment in which top-quality journals exercise market power, I suspect that the cost of these journals, and hence the submission fees they charge, would simply continue to rise at least at the present rate at which subscription fees now increase. While libraries would not pay for these increases, other actors within the research establishment would.

- Second, such a mechanism was tried in the 1970s by some society journals in the sciences. Authors resisted page charges and when private journals emerged that promised no charges, relying instead on subscription fees, authors accepted their invitation, thereby giving them the toehold in the industry that we have come so much to regret. I know of no reason why commercial journals would not simply reject open access provisions and continue under the subscription model. Society journals probably would be the net losers.

- Third, such a proposal would shift much more of the cost of scholarly journals to research universities than currently. Such universities now support much of the cost of producing the research. Grants defer some of the expenses, but basic costs for buildings, personnel, etc, remain with the universities. A plan that shifted more of the cost of even more expensive journals back to universities might do considerable harm to research. M.I.T. library staff, for example, recently calculated the cost M.I.T. would bear under an author charge plan for physics journals and determined that cost would be twice what they now pay for physics subscriptions. Shifting costs in this manner undoubtedly would take funds that ought to be used in the generation of new research, not promulgation of existing findings.

- Finally, an author charge plan to support journals would carry an unfortunate message to authors and their funding agencies. They would receive the message that publications were undesirable byproducts of research in need of disposal, not dissemination, thus title of this paper. Under the laws of most countries, toxic waste has to be properly disposed by its creator, regardless of the cost. Such laws properly provide incentive to producers to produce as little toxic waste as is compatible with production of the product. Is this the message we want to give researchers, their universities or their funding agencies? Just as additional research funding produces more research and additional rewards promote publication, negative monetary reinforcement for publication would surely reduce publication or force the use or creation of some other outlet for research results.

Open archiving established on a completely voluntary basis is unlikely to solve the important problem of making research results available to all through the reestablishment of a gift exchange. For open archiving to succeed it must overcome both the commercial interests that can thwart it by requiring exclusive copyright ownership as a condition of publication and the impossibility of getting **all** researchers to voluntarily archive **all** of their papers and to maintain those archives. In addition, for open archiving to really serve the community it must be implemented in such a manner that scholarly journals and the valuable refereeing services they provide have a sustainable economic basis.

For these reasons, I have proposed elsewhere an open access/open archiving plan that meets each of the Tempe Principles and recreates the gift exchange for scholarship arising out of externally-funded research. The proposal is simple. Agencies as a condition of granting research funding would permit the transfer of copyright from the author to the journal publishing the work for only a fixed period of time, for example three to six months. After that time, the agency would require that the manuscript in the form in which it is published be permanently posted in an archive maintained by the funding agency. Since the journal no longer holds exclusive copyright, the manuscript could also be archived by the author. The purpose of permitting exclusive copyright to the publisher for a brief period of time is to permit the journal to have a revenue stream to support its refereeing, editing and publishing functions. Libraries and selected subscribers would pay for early access to the latest scholarship but the amount they would pay would be tempered by the knowledge that the entire journal contents would be available for free relatively soon. Such a mechanism could be put into effect by the funding agency or by the adoption of national laws. Putting the plan in place would ensure continuation of inexpensive subscription-based refereed journals, while permitting open access to archives of all material after six months.

Three of the Tempe Principles remain to be tested against the open access proposition. Principle 3, *Scholarly publications must be archived in a secure manner so as to remain permanently available and, in the case of electronic works, a permanent identifier for citation and linking should be provided*, is largely satisfied by deposition of manuscripts in archives satisfying the Open Archive specifications. Having funding agencies also maintain an additional electronic copy of the manuscript provides for greater certainty that the document will remain permanently available.

Principle 7, *The time from submission to publication should be reduced in a manner consistent with the requirements for quality control*, is partially satisfied by the proposed open access conditions. The solution is only partial because of the possibility that open archiving will have a deleterious impact on the economic viability of journals and the refereeing process they sponsor. Thus, while open archiving reduces time to “publication” to zero by immediately placing works on a website, it may harm the current quality control mechanism. The time lag modification to open access/open archiving I propose would remedy this problem, as journals would remain viable.

Finally, Principle 9, *In electronic as well as print environments, scholars and students should be assured privacy with regard to their use of materials*, warrants examination. It seems that we increasingly leave electronic tracks that can be followed by skilled, persistent sleuths. Neither the open access proposal we consider here nor my suggested modification solves this problem. Nor does returning through the looking glass to the simpler world of paper publications. The solution to the need for personal privacy may be found in technical means but I rather suspect wise lawmakers are more likely to produce an acceptable fix.

Open access/open archiving can be compatible with the 350-year-old gift exchange tradition of scholarly communications. Indeed, we can improve on those traditions. I ask that we carefully apply the Tempe Principles to any improvement we consider as we collectively have the opportunity to improve a system and this opportunity carries with it the responsibility to do no harm.

