Talking past each other: Making Sense of the Debate over Electronic Publication

David J. Solomon, Ph.D., Office of Medical Educaition, Research and Development, The Department Medicine, Michigan State University, dsolomon@msu.edu

Abstract – This paper discusses the implications electronic dissemination for the peer-reviewed serial publication system. To make sense of this complex issue, it is helpful to view it from the perspective of the origins of the system and its three core functions, the ranking of scholarship, facilitating interactive communication among scholars, and creating a comprehensive archive of scholarly and scientific knowledge. Each of these core functions has different requirements that are to some extent overlapping but also to some extent in conflict. The Internet opens the possibility of developing a variety of different models of scholarly communication each fulfilling to a greater or lesser extent these three roles paper journals have served and possibly other roles that were not even conceivable prior to the development of world-wide electronic networks. The implications of electronic distribution for ownership and access to the scholarly literature are profound and likely to exacerbate the already serious serial pricing crisis that is hindering the widespread access to scientific and scholarly information. The scholarly community, which both authors the material contained in these publications and largely consumes the finish product holds the key to solving this crisis and allowing the Internet to be a vehicle for facilitating the dissemination of publicly funded research and scholarship rather than resulting in its transfer to private ownership.

Three years ago, Harold Varmus proposed the formation of PubMed Central[1] as a federally funded freely accessible Internet-based archive of biomedical publications (Varmus, 1999). While it was not the first proposal for using the Internet to provide comprehensive and open access to scientific literature, the fact it was initiated by the director of the National Institutes of Health (NIH) created a tremendous uproar in both the scientific and publishing communities. Although there was a great deal of support for the concept of creating such an archive, making it successful apparently took more influence than even the director of the NIH could muster. Varmus left the NIH shortly after dropping the PubMed Central bombshell and while the NIH went on to implement the archive, after three years it carries only a small fraction of the vast biomedical literature.

The heated discussion over the proposal that took place during the spring and summer of 1999 is an interesting microcosm of the wider debate that continues on across scientific and scholarly diciplines.[2] The controversy is motivated by two powerful forces that one way or another are going to result in a vastly different system for disseminating scientific and scholarly information. The first, generally referred to as the serial pricing crisis, reflects the dramatic rise in the cost of serial publications over the last 30 or 40 years and indirectly the commercialization of scholarly publishing.[3] The second is the rapid conversion from paper to an electronic dissemination for peer-reviewed serial publications (Van Orsdel; Born, 2002).

At the heart of the debate is the question of who will control the literature and how it will be financed. The serial pricing crisis has stretched research library budgets to the breaking point and effectively cut the developing countries off from the scientific literature. At the same time, the shift to the electronic distribution of serial publications has caused many to question the need for the services provided by commercial publishers and whether the staggering increases in the cost of journals are warranted (Sosteric, Shi, and Wenker, 2001). To make sense of the controversy and begin to develop a coherent plan for reshaping the way scientific and scholarly information is disseminated, it is helpful to step back and look at the origin of our current journals and the complex multifaceted role they play as the fabric of scholarly communication.

The Origin of Peer-reviewed Serial Publications

Although there is some controversy, it is generally agreed that the peer-review serial publication system originated from the *Philosophical Transactions* of the Royal Society of London first published in 1665. What is intriguing is the motivation behind Henry Oldenburg's ingenious creation. Oldenburg, then secretary of the society created the journal mainly out of a need to establish an orderly system for documenting the source of new or novel scientific ideas. In the words of Jean Claude Guédon, he created a kind of a "patent office" for scientific findings.[4] By having a recognized vehicle for presenting new scientific ideas to their colleagues, the scientists or "natural philosophers" of that time could be reasonably sure they would receive appropriate credit for their ideas. Apparently, in the mid-seventeenth century this was no small matter. The concept of peer-review introduced in Oldenburg's new creation was another ingenious and revolutionary ploy. It provided a means for the natural philosophers of the day to bestow a seal of worth and quality on the work of their peers at a time when such powers were generally reserved for nobility.

From this humble beginning, rose the current scholarly publication system made up of thousands of descendants of the original *Philosophical Transactions*, which remarkably is still alive and well today. It seems ironic that the primary motive behind the origins of the system lies less in the lofty goal of disseminating knowledge than in assigning proper credit where it is due. Peer-reviewed scholarly publications continue to play a variety of roles that have changed surprisingly little in nearly three and a half centuries. It is my hypothesis that much of the legitimate debate surrounding the transition from paper to electronic dissemination consciously or unconsciously revolves around the suitability of different media and organizational structures for fulfilling the different aspects of the multifaceted role journals play in scientific and scholarly communities.

The Roles of Scholarly Journals

Although the motivation for creating *Philosophical Transactions* was primarily to limit controversy and promote an orderly scientific institution with a hierarchy based on peer-defined excellence, it is the role of disseminating information that forms the crux of the debate over how the scholarly publication process should be structured. To make sense of the debate, it is helpful to distinguish two somewhat different forms of dissemination that along with ensuring authors receive appropriate credit for their intellectual achievements form the three core purposes

fulfilled by scholarly journals. The first is facilitating the exchange of ideas among scholars working in the same narrow field that is the engine of progress. The second is forming a constantly evolving historical archive of scholarly thought. These three roles of journals have different though overlapping requirements that are also to some extent in conflict.

Science and scholarship is a social activity. Communication among scientists in a field is an essential ingredient for scientific progress and thrives on the free interactive exchange of ideas. The vetting of poor quality material through peer review provides little value for experts in a field while significantly hampering the interactive nature of this type of communication. Likewise, copyediting and typesetting are not particularly helpful as long as a manuscript adequately communicates the intended meaning and again just hinders the interactive nature of the communication. Traditional peer-reviewed journals have never served this role particularly well and their weaknesses have become increasingly apparent, as advances in technology have provided other more suitable options. This role has begun to shift to other forms of communication and in particular, preprint archives, the most notable of which is the arXiv.org in physics and computer science.[5] It is interesting to note that while arXiv.org has become the predominant way physicists communicate, the traditional peer-reviewed physics journals remain strong and in fact have the highest average subscription fees of the journals in any scientific field![6]

Peer-reviewed journals also serve as a continually updated comprehensive and authoritative archive of knowledge. While it is important that the archive reflect the current thought and findings within the field, the need for quick turnaround from submission to dissemination is far less crucial than for the role of supporting interactive communication among experts in a field. Ensuring the accuracy and quality of the information contained in a manuscript as well as the clarity of the writing and quality of the presentation is far more important and in some cases crucial.[7] What is also crucial for this role is the robustness and stability of the archive. Traditional paper journals have served this role exceedingly well. Ironically, what are generally seen as limitations of paper as a media help make it well suited for this role.

The time consuming and expensive task creating multiple copies and distributing them to hundreds if not thousands of research libraries creates an incredibly robust archive that is virtually indestructible with the exception of the slow breakdown of paper over time. It is not that in theory an equally robust electronic archive could be created, it is just not an inherent feature of the media.

Likewise, the immutability of paper creates an almost neurotic concern about the accuracy of the material and the clarity of the presentation that helps ensure a high quality product. As stated by Burbules and Bruce (1995):

> "On the other hand, the care and precision of proofreading, revision, editing, designing and typesetting manuscripts to create an authoritative (and aesthetically appealing) version of an author or authors' document has traditionally been linked with the finality of creating a printed, bound version that will be archived as such for posterity. Both the producer of the text and its editor and publisher

> have a common interest in seeing it be as complete, persuasive and carefully written as possible, since there is a sense in which, once published, there is no taking it back. The printed medium, therefore, has distinct benefits." (pp16-17)

Again, it is not that this level of care and concern cannot be achieved in electronic publication; it is just not an inherent feature of the media.

As has been the case for hundreds of years, publication in peer-review journals remains a cornerstone in the ranking of scholarly achievement. What has changed is that there are now thousands of peer-reviewed journals. A hierarchy of journals has developed in most fields that form a complex ranking system for the quality of an individual's scholarship. To some extent, this hierarchy of journals is contained in a tacit understanding among the scholars in a field. As noted by Guédon (2001) it has also been codified to some degree through citation indexes that record the extent journals are cited. Ironically, these indexes, which were created to help librarians deal with the difficult question of which journals to subscribe have substantially exasperated the problem they were designed to help address. By providing a vehicle for codifying the concept of "core journals" within scholarly fields, particularly in the physical sciences, these indexes have created a situation that has allowed at least some unscrupulous publishers to raise the price of the core journals they own through the roof, in the view of some, creating the serial pricing crisis. The ten-fold spread in the average cost of journals across scholarly fields with the arts and letters at the low end and the physical sciences at the high end tends to support this hypothesis.[8]

From Paper to Packets

The conversion from a paper to an electronic publication is happening much more quickly than many of us might have imaged. We are currently in a transition phase where the majority of peer-reviewed journals are produced in both paper and electronic formats. There is evidence however that we have turned the corner so to speak towards the electronic versions of journals becoming the predominant media, at least from a pricing perspective (Van Orsdel and Born, 2002).

The move to electronic media is going to have a significant impact the relationship among authors, librarians and publishers. Many of the more time consuming roles played by librarians and publishers will begin disappearing. The key question is who will fulfill the roles that will remain and more importantly in doing so, control the scholarly dissemination system. At one extreme librarians may become little more than specialized purchasing agents that negotiate licensing agreements with a few monolithic publishers for large blocks of digital content that will be delivered directly from publisher-operated servers. At the other extreme are open archiving models where authors self-archive papers in a variety of different types of archives, some vetted by peer-review and some not, tied together by the inclusion of standard metadata that can be accessed by automated indexing software (Van de Sompel and Lagoze, 2000).

Intellectual property rights are one of the thorniest issues in the transition from paper to electronic media. The conventions and laws that govern copyright have grown up over hundreds

of years. Though it apparently took some time to sort out, a workable system of compromises developed that protected the ownership rights authors and publishers while allowing the purchasers of their material a reasonable amount of flexibility in using what they bought. More over, what rights the purchasers bought, they bought for posterity, or at least until the paper crumbled. Unfortunately, with the emergence of digital media, the system has become dysfunctional and attempts to remedy it such as the 1998 Digital Millennium Copyright Act (DMCA) are at best works in progress.

It appears journal publishers are starting to follow the lead of their cousins in the software industry in abandoning the reliance on copyright in favor of licensing agreements. With licensing agreements, the checks and balances in the rights and responsibilities of the owner and purchaser of intellectual property that developed over hundreds of years are gone. The move has wiped the slate clean and everything is on the table in the negotiation of these agreements. Of particular concern is that license agreements are for a fixed period. In the past, when a library dropped a subscription to a journal, it at least kept the issues it has already purchased. With licensing agreements, the material is being rented and at the end of the license period everything aspect of the arrangement is up for negotiation. The ramifications of this for our archives of scientific and scholarly information are profound to say the least, particularly coupled with the fact that a few large publishers are gobbling up smaller publishers at an alarming rating and in the process acquiring their journals. Reed Elsevier alone acquired over 400 journals in 2000 (Willinsky and Wolfson, 2001) and currently controls around 30% of the lucrative scientific, technical and medical journals (Kirkpatick, 2000).

We Have Met the Enemy and He is Us[9]

Several years ago, I was confident that when the dust settled in the transition from paper to electronic distribution, we would have a responsive and reasonably priced open access system for scholarly dissemination (Solomon, 1999). Today I am far less sanguine about the future. On one hand, the scientists and other scholars produce the raw material and largely consume the finished product. By voting with their feet so to speak, they can choose where they publish and where they seek information. At the same time, thousands of jobs and huge sums of money are riding on how the scholarly publishing system evolves. If recent history is any indication, the large commercial publishers are going to fight hard to keep the goose that has been laying them golden eggs for the last 30 or 40 years. Although the scientists and other scholars hold the ultimate trump card in determining who controls the serial publication system, the publishers are both far more motivated and far more savvy. As noted by Andrew Odlyzko (1999):

> "What keeps the publisher's situation from being hopeless is the tremendous inertia of the scholarly community, which impedes the transition to free or inexpensive electronic journals."

As we transition from paper to electronic distribution of scholarly journals, there is a unique opportunity to shape the structure of the system or systems that will replace paper journals. If left to their own devices the publishers will gladly shape the system in ways that best serve their ends. They are simply businesspeople doing what businesspeople do. Their fiduciary

responsibility is to their stockholders not to academia, or for that matter the public. As noted by Guédon (2001), while there is a great deal of rhetoric about the virtues of a free market, every capitalist in their heart of hearts loves a good monopoly. Just ask Bill Gates or more to the point the ghost of poor Henry Barschall.[10] What is particularly chilling is that with licensing agreements as the framework for providing access to electronic journals, the large publishing companies will be cornering the market on scientific and scholarly knowledge largely paid for with public funds. If this is not a fleecing of America or for that matter the world, it is hard to imagine what is. Unfortunately, this one is probably too complex for the NBC nightly news staff to cram into a two-minute sound bite.

Where Do We Go from Here

While it is likely the roles scholarly journals have played for almost 350 years will remain, electronic dissemination offers tremendous opportunities to enhance scholarly communication. It probably will be some time before we even fully appreciate the possibilities this new media offers let alone fully exploit its potential. For at least the near term it is likely a number of different models of scholarly communication will develop, each fulfilling to a greater or lesser extent the various roles paper journals have served and possibly other roles that were not even conceivable prior to the development of world-wide electronic networks.

One of the more interesting developments are information portals that integrate a variety of communication modalities as well as archived data in a particular field forming a kind of one stop shopping mall for the communication of research and scholarly information. Examples include H-NET (http://www2.h-net.msu.edu/, access 25 June 2002) in the humanities, the Public Knowledge Project at the University of British Columbia (http://www.pkp.ubc.ca/, access 25 June 2002) in education and BioMed Central (http://www.biomedcentral.com/, accessed 25 June 2002) in the biomedical sciences. These portals, each somewhat different in structure, include electronic journals, pre-print archives, threaded discussion lists and in some cases archived data sets all tied together through indexing strategies generally based on metadata imbedded with the material.

Most of the concerns voiced about moving away from traditional journals to other models of dissemination such as these portals revolve around the role of archiving scientific thought. Critics have questioned whether the stability and robustness of electronic archives can be maintained without a reliance on traditional publishers. They are also concerned as to whether the quality of the peer-review, copyediting and formatting would suffer without the expertise and resources of the traditional publishers. An example of this view is expressed by the editor of Science, Floyd Bloom (1998).

> "Neither the public nor the scientific community benefits from the potentially no-holds-barred electronic dissemination capability provided by today's Internet tools. Much of the information on the Internet may be free, but quality information worthy of appreciation requires more effort than most scientists could muster, even if able." (pp.1451)

It is true that robustness and stability while an inherent feature of a paper distribution system must be explicitly built into an electronic distribution system. Electronic archives also need continual maintenance and updating to keep up with changes in electronic storage media and data formats (Martin and Coleman, 2002). Although these concerns reflect a critical issue that must be addressed , I question whether sticking with the traditional "pay-for-access" economic model and relying on commercial publishers for maintaining the archives is any less dangerous than developing alterative author/librarian controlled mechanisms particularly with the shift from copyright to licensing agreements. The publishers probably would continue to do a good job of managing publication process and develop the expertise necessary to manage the archiving processes. The real question is at what cost and under what terms of access.

There are plenty of examples of truly excellent freely accessible peer-review electronic journals maintained by individuals or small groups of faculty, which suggests Bloom's assertion is overstated as well as insulting. As far as maintaining the archive, there is no group with as much expertise and experience in this area as our current research librarians. Given adequate resources, they are every bit as capable as commercial publishers in managing the archives of scholarly knowledge.

We need to move away from what Stevan Harnad has called the author's "Faustian Bargain" of trading copyright for managing the publication and dissemination processes (Harnad, 1997). This might have made sense 50 years ago when virtually all journals were published by scientific societies and only large organizations had the resources to print and disseminate journals. Today it is just a bad deal and a publicly funded rip-off. This is not to say commercial publishers have nothing to offer. They are very good at what they do and can continue to provide valuable services. They should however be paid a reasonable price for the services they provide instead of being given the finished product for what amounts to a small fraction of the total effort that goes into creating it. This would this keep the public knowledge base public and create true free market competition among the various publishers who would have to bid for the right provide the services they can offer.

Although there is a growing awareness in academia of these issues, the response so far has been disappointing. Open archiving initiatives are popping up at many universities and there are a growing number of freely accessible electronic journals. The vast majority of faculty members continue to sign over copyright in order to disseminate their scholarly work through traditional publishing models with little regard for ownership issues and subscription fees. Nothing much of course is going to change as long as academic excellence is measured in tonnage weighted by rankings on the appropriate citation index. It is not realistic to think, an assistant professor seeking tenure is going to give up the opportunity to publish in a prestigious journal just because it has a five-figure yearly subscription fee.[11] Over the long haul, this will probably change or at least we can hope common sense will prevail. Unfortunately, time is not on our side. It will not be long before electronic-only access via license agreement becomes the norm for the majority of traditional journals. As it does, our scientific and scholarly knowledge base bought with public funds will become privately owned.

The thought of changing academic norms and in particular the actions of promotion and tenure committees bring visions of herding cats. It is probably not any easier to get academic governance to make major policy changes but at lest there are less of them convince. I believe lobbing at that level may be our best hope of quickly recapturing the public knowledge base. The problem could largely be solved by colleges and universities working through their libraries or better yet library consortia to develop Open Archive Initiative (OAI) compliant archives and require faculty at their institution to archive preprints of their manuscripts before submitting them for publication. The costs of setting up and maintaining such archives would not be large, particularly in comparison to what research libraries are paying for published journals. More over, the true cost of not doing something to stem the tide of transferring public knowledge to private ownership cannot even be calculated.

Hopefully academic administrators will begin to realize that it is in their best interest to proactively address the commercialization of scholarly publication. Some faculty members may consider this as an infringement of their academic freedom but it seems is a small price to pay for keeping the public knowledgebase public. Archiving preprints would not limit other forms of publication and faculty should realize who is subsidizing their time and providing the resources that support of their research and scholarly work.

The one legitimate concern with this proposal is that prestigious journals may refuse to publish manuscripts that have been archived as preprints on public servers jeopardizing the careers of faculty at institutions that require preprint archiving. This is in fact already the case for some journals. NetPrints™ for example lists 22 prominent biomedical journals that refuse to publish manuscripts that have previously appeared as preprints (http://clinmed.netprints.org/misc/policies.shtml access 26 June 2002).

While this is clearly an issue, it is unlikely that publishers would continue to do this if a significant number of research institutions adopted this policy. Publishers of prestigious journals have a great deal of leverage, but this power is also fragile. The minute authors turn to other avenues for disseminating their best work, the hold these publishers have over the academic community quickly dissipates.

It is also worth noting that the need for the services publishers have provided in the past is dwindling. Virtually all the effort required for running the peer-review process short of the work scientists and scholars provide the publishers at no cost can be automated through the coordination of e-mail, HTML forms and server-side database applications. Beyond that, copyediting and formatting manuscripts is all that remains in preparing a manuscript for publication. Sophisticated word processors and typesetting applications, while not fully automating copyediting and formatting have greatly reduced the effort and skill required to produce a well-written and professionally formatted document. Indexing, archiving and disseminating manuscripts are also part of the process but these have traditionally been done by librarians who are more experienced and better trained at performing these tasks than the commercial publishers.

Financing Scholarly Dissemination

Maybe the best things in life are free but research and scholarship are not among them. It takes huge amounts of resources to do research. The proposed 2003 NIH budget alone is over 27 billion US dollars (White, 2002). While there is some debate about the costs of disseminating research, it also clearly takes resources.

The obvious question is how are the costs of dissemination going to be recovered. The current pay-for-access model is a bad mechanism for a number of reasons. It made a little more sense with a paper distribution system where at least a significant part of the cost was tied to actual dissemination. With electronic dissemination, the actual costs of dissemination are trivial. The real costs are in the preparation of manuscripts for dissemination and maintaining the archive.

The most serious problem with the pay-for-access model is that it cuts off large segments of the population from the literature. This includes for all practical purposes people in the developing world. It also excludes much of the public in the developed world who do not have access to a research library, the very people who largely subsidized the research and scholarship in the first place. Not only is this mean-spirited and ethically wrong, is it just plain stupid.

We in the developed world do not have a monopoly on intelligence or good ideas. It is a two-way street or more appropriately information highway. By cutting off the scientists and other scholars in the developing world from the literature, we in the developed world are also effectively cutting ourselves off from their input. They may not have state-of-the-art laboratories and other resources to conduct certain types of research but they still have plenty to offer including far more experience in addressing many of the most critical problems that are facing the word as a whole.

By cutting off the general pubic from the primary scholarly literature, the pay-per-access model significantly limits the value of research. As pointed out by John Willinsky (2000) most people have limited exposure and less understanding of social science and educational research, yet they are interested in the issues these fields address which affect their every day lives. Also through their elected representatives, they make important public policy decisions with little benefit of what has been learned from the research on these issues. One could argue that even if this literature were easily accessible, few people would read it. There is evidence that this is not necessarily the case. *Education Policy Analysis Archives* (EPAA) (http://epaa.asu.edu/epaa/, accessed 27 June 2002) is a superb freely accessible scholarly electronic journal that addresses topics such as the impact of competency testing and the effectiveness of charter schools that are of great interest to many people and on which important and controversial public policy decisions are currently being decided. Over 1.5 million copies of articles from the journal have been downloaded since EPAA's was first published in 1993. More over, the server logs from the journal suggests the bulk of the articles were not being downloaded by people at research institutions.[13]

For those of us lucky enough to have an affiliation with a large research library, electronic access to journals is still far more frustrating and difficult than it should be. Electronic dissemination should provide nearly seamless access to the literature from any Internet connected computer. It

instead ends up being a litany of passwords, proxy servers and worrying about having the correct IP address, all solely to ensure the publishers can capture their fees. The one unintended benefit of this nonsense is that it encourages scholars, and for that matter, everyone else to seek information from more readily accessible sources. With core journal status resting on citation rankings, the expensive and hard to access journals are increasingly dooming themselves to obscurity.

The critics of free access to scholarly manuscripts imply those of us who support this goal want something for nothing (Okerson, 2001). What we want is simply what we paid for when we signed our tax returns. Not only does public money fund research; it also largely pays the library subscription fees that fund the serial publication system. There are more than adequate resources available for disseminating and ensuring the long-term availability research findings. In fact, if one looks at the bottom line of the commercial publishers, we are clearly overpaying for what we are getting (Hipps, 1999).

What is needed is a relocation of the public resources that are already being used to fund publication and dissemination. Since the bulk of the funding flows through the research libraries, they are the obvious place to begin to redirect the funds needed to develop and maintain open access systems for managing the publication and dissemination process (Willinsky, 2000). It also seems obvious that librarians are the ideal people to lead the development and management of these archives as this is their area of scholarship and research.

There is also no reason why a variety of viable electronic dissemination models cannot develop and coexist. BioMed Central is an interesting example of how a commercial publishing firm can collaborate with authors and librarians in a constructive and equable partnership to disseminate research and facilitate scholarly communication. Rather than the traditional pay-for-access to manuscripts, BioMed Central charges authors for publication. This is not a new model and one with almost as many shortcomings as the pay-for-access model. BioMed Central however tries to address these problems in several ways. First, publication charges are waved for authors from developing countries and on a case-by-case basis for authors from developed countries who plead poverty shifting the cost of publishing their manuscripts to entities that have the resources to pay publication fees. BioMed Central also offers institutional memberships for a flat fee based on the size of the institution. Membership entitles any employee of the organization to publish at no additional charge in any of BioMed's more than 50 peer-reviewed journals. Secondly, BioMed Central allows authors to retain copyright and control over their manuscripts only requiring a limited license agreement that gives BioMed Central rights to publish the manuscript. BioMed Central journals are peer-reviewed, professionally edited, indexed in PubMed and freely available through PubMed Central. The site also offers a variety of other useful modes for facilitating scholarly communication.

The key question is whether BioMed Central approach is a viable model. I suspect, will largely depend on whether universities and other research institutions are willing to pay for institutional membership. Unfortunately it appears most are taking a wait and see attitude which could doom a very worthwhile project to extinction. The yearly fee of $7,500 for a large university or other research organization seems quite reasonable when one considers a library subscription fee for a

single journal; *Brain Research* is well over twice that amount of money. It is true that libraries or library consortia in theory could provide the services offered by BioMed Central, which go way beyond just maintaining electronic peer-reviewed journals. It may turn out to be cost effective and simpler to transfer these responsibilities to a commercial publisher as long as they charge a reasonable price for the services they provide rather than demanding ownership of the material.

Conclusion

The vast differences between paper and electronic media have totally upset the apple cart of scholarly publishing. It has also provided scientists and other scholars with a unique opportunity to improve the way they communicate as well as take back control of their own material. Ann Okerson (2001) and others have argued that we will be doing a great disservice if we rush off into uncharted territory developing new untested dissemination models and in the process destroy a publishing system that has worked reasonably well for many years.

> Schemes to drive publishers to stop publishing will find fifty ways to backfire, ways that we cannot now fully imagine. The idealism of the moment needs to express itself in a way commensurate with its own principles, by establishing dialogue, building community and giving standards and consensus time to develop (Okerson, 2001).

I suspect Ms. Okerson has little to fear. Nothing in academia changes all that quickly. The risks posed by not developing dissemination models that leave public knowledge in the public domain are far more serious. Dialogue is being established and new models are being tested. As noted above, electronic dissemination has given us the flexibility to develop a variety of different communication and dissemination models each with its own strengths and weaknesses in fulfilling the various roles that have been served by peer-reviewed serial publications. Furthermore, the development and use of standardized metadata imbedded within these archives provides the capability for automated indexing that can search across archives allowing vast arrays of information to be accessed efficiently.

The BioMed Central experiment is an example of how commercial publishers can continue play valuable and constructive roles collaborating with authors and librarians in creating public access knowledge portals while making a reasonable profit. Although it is not perfect, the BioMed Central model is far superior to trading away ownership of publicly funded research results for publication and dissemination. The pioneering work of John Willinsky and the Public Knowledge Project (http://www.pkp.ubc.ca/, Access 25 June 2002) has also demonstrated that much of the tedious time consuming effort of managing the peer-review publication process can be automated.

Pogo was right, we have met the enemy and he is us. Those of us who publish scholarly papers will get exactly the dissemination system we choose, whether it is a conscious decision or not. One way or another, the current peer-reviewed scholarly journals will have to evolve. If we choose to continue to sign over the copyrights to our manuscripts in order to have them

published, the publishers will develop systems that best fit with their interests — not ours, or those of the public. Librarians know the situation all to well; they just are not in a position to change the outcome. Only the academic community has that power.

End Notes

1. The proposal was originally call E-BIOMED.

2. ARCHIVE OF COMMENTS ON E-BIOMED: A Proposal for Electronic Publications in the Biomedical Sciences (May 5, 1999 DRAFT) http://www.nih.gov/about/director/ebiomed/comment.htm , accessed 30 March 2002/

3. For example see Monograph and Serial Costs in ARL Libraries 1986-2000. http://www.arl.org/stats/arlstat/graphs/2000t2.html, Accessed 27 March 2002.

4. I strongly urge anyone interesting in this topic to read Jean-Claude Guédon's fascinating address to the May 2001 meeting of the Association of Research Libraries (ARL) http://www.arl.org/arl/proceedings/138/guedon.html, Accessed, 30 March 2002)

5. arXiv.org e-Print archive can currently be found at http://xxx.arxiv.cornell.edu/ , 08 April 2002.

6. See Chart 4 on page 478 of Branin JJ Case M. Reforming Scholarly publishing in the sciences: A librarian perspective. Notices of the AMS Available from http://www.ams.org/notices/199804/branin.pdf , accessed 11 April 2002.

7. The danger of inaccuracies in the published literature was one of the arguments against the development of the proposed preprint archive that was included in the original E-Biomed proposal.

8. See Chart 4 cited in Branin's article cited above in 6.

9. See http://www.nauticom.net/www/chuckm/whmte.htm, for a reference (27 May 2002.

10. Henry Barschall wrote a series of articles in 1986 and 1988 based on studies comparing the price and value of commercial and society published physics journals. The articles were published by journals of the American Institute of Physics and the American Physical Society. Several of the physics journals published by Gordon and Breach Publishers did not fair well in Barschall's studies and the publisher sued Baschall and both societies in Germany, Switzerland France and eventually the USA. The suits and related appeals spanned 12 years, several years after Dr. Barschall's death in 1997 at which point Gordon & Breach added his survivors to the litigation. Gordon & Breach eventually lost or dropped the whole litany of suits and subsequent appeals. A detailed presentation of the USA litigation can be found at: http://barschall.stanford.edu/, accessed 15 June 2002 .

11. This is not a typographical error. See http://www.hshsl.umaryland.edu/information/news/exhibits/money/index.html for examples of journals with annual library subscription fees of well over $10,000.

12. This is a complex issue but I believe it is reasonable to say the vast bulk of the knowledge and thought that is disseminated through scholarly journals is funded either through government funded grants and contracts and/or subsidized through public institutions of higher learning.

13. Personal communication with Gene Glass, editor and founder of EPAA.

References

Burbules NC and Bruce BC, 1995 "This is not a Paper," *Ed Researcher*, volume 24, number 8, pp.12-8.

Bloom FE, 1998 The Rightness of Copyright, *Science* volume 281 pp. 1451.

Guédon J, "In Oldenburg's Long Shadow: Librarians, Research Scientists, Publishers, and the Control of Scientific Publishing", Presentation to the May 2001 meeting of the Association of Research Libraries (ARL), http://www.arl.org/arl/proceedings/138/guedon.html, access 30 March 2002.

Harnad S., 1997, "The Paper House of Cards" *Ariadne* volumne 8 http://www.ariadne.ac.uk/issue8/harnad/, accessed 30 May 2002.

Hipps K., 1999 "Update on Scholarly Publisher Profits", *A Bimonthly Report on Research Library Issues and Actions from ARL, CNI, and SPARC.* (207) December http://www.arl.org/newsltr/207/pubprofits.html (01 June 2002).

Kirkpatick DD., 2000 "As publishers perish, libraries feel the pain", *New York Times*, November 3, 2000.

Martin J., Coleman D., 2002 "The archive as an ecosystem" *Journal of Electronic Publishing* volume 7 number 3 http://www.press.umich.edu/jep/07-03/martin.html, accessed 15 June 2002.

Odlyzko AM. 1999 "Competition and Cooperation: Libraries and Publishers in the Transition to Electronic Scholarly Journals" *Journal of Electronic Publishing* volume 4 number 4 http://www.press.umich.edu/jep/04-04/odlyzko0404.html accessed 2002.

Okerson A 2001, "What price "free"?" *Nature Web Debates,* http://www.nature.com/nature/debates/e-access/Articles/okerson.html access 01 June 2002.

Solomon DJ., 1999 "Is it time to take the paper out of serial publication?" *Medical Education Online* volume 4 number 7, http://www.Med-Ed-Online.org accessed 16 May 2002.

Sosteric, M., Shi Y., Wenker O., 2001 The upcoming revolution in the scholarly communication system. *The Journal of Electronic Publishing* volume 7 number 2, http://www.press.umich.edu/jep/07-02/sosteric.html accessed 30 March 2002.

Van de Sompel H, Lagoze C., 2000 "The Santa Fe Convention of the Open Archives Initiative" *D-Lib Magazine* volume 6 issue 2 http://www.dlib.org/dlib/february00/vandesompel-oai/02vandesompel-oai.html accessed 20 May 2002.

Van Orsdel L, Born K , 2002 "*Periodicals Price Survey 2002: Doing the Digital Flip*" *Library Journal* http://libraryjournal.reviewsnews.com/index.asp?layout=article&articleid=CA206383&publication=libraryjournal accessed 20 April 2002,

Varmus H. 1999 "Original proposal for E-biomed (Draft and Addendum) E-BIOMED: A proposal for electronic publications in the biomedical sciences" http://www.nih.gov/about/director/pubmedcentral/ebiomedarch.htm accessed 30 March 2002.

White R., 2002 "Overview of current issues at NIH" *Proceedings from the NIH Regional Seminar* April Lansing, Michigan.

Willinsky, J., 2000 "Proposing a knowledge exchange model for scholarly publishing." *Current Issues in Education* volume 3, number 6. http://cie.ed.asu.edu/volume3/number6/ accessed 20 May 2002.

Willinsky, J, Wolfson L., 2001 The Indexing of Scholarly Journals: A Tipping Point for Publishing Reform? *The Journal of Electronic Publishing* volume 7 number 2 http://www.press.umich.edu/jep/07-02/willinsky.html accessed 20 May 2002.