Principles for a New System of Publishing for Science

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Introduction

The conviction is now widespread that the existing system of scholarly communication through traditional journals is breaking down. The most visible symptom of the breakdown is the inordinately rapid price inflation of journals and the resulting subscription cancellations by libraries. Below I delve into the economic reasons for the breakdown, outline the suggested remedies and convey a report on the elements of a proposed replacement system of scholarly communications arising out of a March 2000 meeting in Tempe, Arizona.

The Peculiar Market for Scholarly Communications

The function of price is to ration the available quantity of a good such that it ends up in the hands of those who have the ability and desire to purchase it. Market economies, by definition, use the market to set prices and to distribute goods. Rising prices for a good preclude the purchase of that good for some, but provide an incentive for producers to produce more. Ultimately, production of the good increases and price is reduced by competition and supply to the cost of producing additional units of the good.

To economists, scholarly journals and journal articles are "goods." In recent years their prices have risen significantly and the quantity of journal articles has also risen. According to the Association of Research Libraries, serials subscription prices in U.S. dollars rose 207% between 1986 and 1999. During the same period, Ulrich's International Periodicals Directory's listing of titles increased by 55%. Is this increase in quantity-supplied evidence of a market moving toward equilibrium? Are we about to see falling prices in response to increasing supply? Perhaps. But if this is so I expect that such price behavior will occur in the long run, a period when, as Lord John Maynard Keynes observed, "We are all dead."

What keeps this market from having prices that respond to increased supply is its very nature. It is highly segmented, with the most prestigious segments being nearly completely price inelastic. These segments include those top few journals in each discipline that scholars and practitioners understand to be the repositories of the most carefully refereed literature. Publishing in one of these few journals on a repeated basis signals that an established scholar is among the elite; publishing a single article identifies a young scholar on a trajectory to join that elite. No reputable academic research institution in which the discipline is studied would seriously contemplate dropping a subscription to one of these journals.

It is not easy for a journal to enter this elite group. Because these journals publish what is acknowledged to be the best material in a field, new scholarship is sent there first and appears in journals in lower tiers only if it is first rejected by those in the top. Journals can rise into this top tier but it takes much time to develop top tier cachet. Generally, the route to the top is through the emergence of a new sub field that is not initially published in the established top journals; for example, the emergence of econometrics spawned journals that are now in the top tier of economics journals. Importantly, it is not head to head competition that generally leads to the emergence of a top tier journal but expansion of the field.

Inelastic demand permits one to raise prices with subscription quantity falling less rapidly than price rises. Profit margins can be increased when prices are in this range and increased profit margins can then be maintained. According to Brendan Wiley, the top four commercial publishers of scholarly journals, Wolters Kluwer, Reed Elsevier, Wiley and Plenum had average net profit margins of 18.8% in
rely on the Los Alamos server, a repository of unreviewed manuscripts. A common experience we all share is membership on list serves that present manuscripts reporting what colleagues in our own areas are doing. A search of any university website turns up manuscripts on many topics. This so-called “gray literature” provides access to scientists to much that is not owned or catalogued by our libraries.

But while the gray literature may provide access to material unavailable in one’s university library, it is not an acceptable substitute for library access to the scientific literature. The gray literature generally is not adequately indexed and archived such that one can systematically search or rely upon it as a repository of scientific information in the future. One can easily make the case that relying upon it as a source of transmitting and preserving the scientific literature will create great difficulties or impossibilities in accessing that literature in the future. (The author has cited some of the gray literature of the scholarly communications movement in footnotes. While web sites for this literature are accessible now, no assurance can be given that they will remain accessible 75 years into the future.) In addition, much of the gray literature is accessible only to those who are in certain social or professional networks. This system is hardly conducive to access to the literature by new scholars and scholars in the third world who are not privileged to have such access on their desktops.

Using price to ration access has resulted, in my view, in an inappropriate loss of access to the literature. Rationing by price is inappropriate when use of a good by one individual does not reduce its availability or utility to other individuals. Such is clearly the case with scholarly literature. Unlike physical goods, access to and knowledge of the scholarly literature may well increase the societal value of the good. Economists call such goods “public goods.” An example of such a public good is the polio vaccine where increased access and use improves the lives of all those in the community. With goods whose public benefit is great, market societies often choose to either subsidize access or to make them available for free. Market-rationed access limits availability and reduces benefit.

It is especially curious that we have fallen into market-rationed access to scholarly communication because the public generally funds the production of the research that is reported in scholarly journals. The ultimate funding source may be a publicly-funded research grant, a taxpayer-funded institution, student-paid tuition, etc. The research costs are funded by the public, the results of that research are written by the scholars that produced the research, submitted to a journal and refereed by other scholars, and then given in total to a journal that edits it, publishes the manuscript in a journal, and then charges whatever price the market will bear for that research. Note that the journal is not constrained to charge for the value that it added to the article by the publishing process; it is able to charge for the full value of the article even though it added only a fraction to its value.

Logic of this sort led a group of Association of American Universities’ provosts to declare that the following principle should apply to scholarly literature: “Common ownership of goods holds that research and scholarship are products of
social collaborations and are assigned ultimately to the community.” Because of this conviction and the generally held conclusion that it is inappropriate to ration scholarly literature by price, many proposals have been made and many efforts are underway in the United States to regain access to the literature for the community. Below I briefly describe some of those proposals and efforts.

Proposed Remedies

Increasing library budgets. While many institutions are doing this, few are succeeding in keeping up with cost increases; I know of none that is keeping up with the pace of additions to the literature. Increasing budgets is doomed to failure as a strategy for increasing access to scholarly literature if employed on a large scale because demand for key segments of the scholarly literature is price inelastic and the supply of top ranked journals in each field is also price inelastic. Increased budgets for library material will simply cause prices for scholarly journals to increase even more rapidly. It is clear that larger budgets will not cure this crisis.

Preprint Servers. The most famous server is at Los Alamos and serves the physics community (http://xxx.lanl.gov/). Its cost for making the literature available to the community is only $1 per article. While it is a source of unrefereed material, it is very widely used by the community. Unfortunately, the widespread availability of literature through this source has not led libraries to drop subscriptions to physics journals. Thus, it has not reduced the libraries’ cost of accessing the literature.

Open Archives Initiative. This initiative aims to create archives that are accessible and interoperable in order to efficiently distribute scholarly information. The effort grows out of e-print servers like the one in Los Alamos. At various sites, software that will enable institutions to place scholarly works on local servers and to have that material accessible worldwide as part of a virtual collection is in beta testing. The specifications for the system arose out of the Santa Fe convention, a meeting of knowledgeable parties held especially to establish such specifications.

Minimal Refereeing Servers. The U.S. National Institutes of Health have put in place a resource called PubMed Central. One part of PubMed Central is a free electronic distribution source available to journals that choose to use it. The other part was a proposed minimal refereed service, which was supposed to make articles available to the biological/medical community in a manner similar to that of the Los Alamos server. The medical community in particular found unacceptable the distribution of any lightly refereed or unrefereed literature, especially if anyone could infer from the distribution source that it was “approved” by a government agency.

SPARC (Scholarly Publishing and Academic Resources Coalition). This coalition aims to provide alternatives to the commercial press and has spawned a number of ventures, among them are journal titles that directly compete with those published by large commercial houses. Other SPARC ventures attempt to keep the scholarly literature in society hands and make it more easily and usefully available to scientists. SPARC’s members provide a market for the products they spawn and help assure them of success. I sit on the Board of Directors of an innovative SPARC effort called BioOne. BioOne is an electronic collection of approximately 40 whole organism biology journals that will be made available electronically in a single, searchable package in March of 2001.

Antitrust Activity. U.S. antitrust authorities have yet to initiate a major action against an anticompetitive move by large commercial journal publishers. The difficulty is the criteria used in pursuing cases. Generally, no publisher holds a proportion of the market sufficient to trigger action when it acquires another journal. The Association of Research Libraries has asked that the Justice Department investigate the proposed acquisition by Elsevier of a portion of Harcourt General, including Academic Press. I note that European antitrust authorities have successfully opposed some combinations.

Decoupling. This is a proposal by a group of Association of American Universities’ provosts that disciplinary societies set up boards to referee manuscripts so that refereeing could be dissociated from publication. The logic is that faculty evaluation groups that decide issues of tenure, promotion, salary, etc., attach great prestige to authors whose papers have been accepted by top tier journals. The ability of a journal to transmit such value to those who publish in its pages in turn creates great demand for that journal. Providing a method of refereeing papers separate from the journal review process would break this chain and reduce the ability of the journal to create value for itself by refereeing faculty work. Many U.S. academics fear that decoupling would result in monopoly review processes by societies that might stifle creativity and reduce scientific progress. At this point no society has established a decoupled review process.

Buying Cooperatives. Many library coalitions exist in the U.S. and elsewhere that aim to use the monopsony-like power of the associated libraries to offset the monopoly-like power of commercial publishers. Generally, such cooperatives are successful in moderating price increases or softening restrictive use clauses. Unfortunately the cooperatives’ members do not have the freedom to tell the suppliers of journals like Brain Research they will not buy the journal if their conditions are not met as such journals must be part of selected research library collections. Without this ultimate bargaining power, the cooperatives’ impact on prices is severely limited.

NEAR (National Electronic Article Repository). NEAR is a proposal by the author of this paper that a publicly accessible repository be established into which all articles would be placed 90 days after journal publication. This proposal aims to limit the exclusive ownership of manuscripts by the journal to a 90-day period. Because those manuscripts would be freely available 90 days after publication, a journal’s ability to raise prices would be limited as libraries could
simply wait 90 days and have the articles for free. This is a conservative effort aimed at providing publishers sufficient revenue to cover the cost of refereeing, editing and publishing the journal but returning the remainder of value to the public.

**Author Boycott.** As of April 1, 2001, more than 13,000 scientists have signed the following journal boycott pledge: “To encourage the publishers of our journals to support this endeavor, we pledge that, beginning in September, 2001, we will publish in, edit or review for, and personally subscribe to, only those scholarly and scientific journals that have agreed to grant unrestricted free distribution rights to any and all original research reports that they have published, through PubMed Central and similar online public resources, within 6 months of their initial publication date.” This effort incorporates elements from the PubMed Central and the NEAR efforts.

**Control of Societies by their Members.** As faculty have become aware of the complex and serious problems confronting scholarly communications, they have begun to insist that their societies retain ownership of journals rather than selling them to commercial publishers and that the journals be operated and priced such that all journal revenue be used to support only the journal. Actions of this sort may keep the problem from growing worse, but will not cause prices of commercially owned journals to be reduced.

This impressive array of thought and activity reflects the discontent with the current scholarly communications system. Each of the activities/proposals has much individual merit. But one must be mindful of the words of H. L. Mencken: “There is always an easy solution to every human problem – neat, plausible, and wrong.” While any or all of them may have roles to play in the future of scholarly communications, they do not now form a system on which scholars can rely for distribution and preservation of scholarly communication. The effort to develop the parameters of such a system is described below.

**Development of Principles for Emerging Systems of Scholarly Communications**

Because of the widespread recognition of the severity of the problem, the Association of American Universities, The Association of Research Libraries, and the Merrill Center for Advanced Studies of the University of Kansas convened a gathering of knowledgeable university presidents, provosts, librarians, representatives of scholarly associations, librarians, heads of university presses and representatives from the ARL and AAU to attempt to establish principles that should govern a new system of scholarly communications. Only representatives of the academy were invited, as our aim was to describe the conditions creating a scholarly communications system that would serve the academy.

The gathering produced the following principles that were agreed to unanimously by the participants. The Association of American Universities, the Council on Academic Affairs of the National Association of State Universities and Land Grant Colleges and the Association of Research Libraries have endorsed it for discussion on university campuses during this academic year. Many vigorous discussions have already been held and there is much support for the principles in the U.S. academy.

The Principles certainly are applicable beyond the boundaries of the United States. In fact, as the scholarly communications system is worldwide, solutions must be also. I am very pleased for the opportunity to report the Principles to this conference in the hope that they will lead to development of a new worldwide scholarly communication system. The verbatim principles and accompanying text as adopted by the signatories are reproduced here.

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**Appendix**

**Principles for Emerging Systems of Scholarly Publishing**

**May 10, 2000**

The following set of principles was agreed to by the undersigned individuals as a result of a meeting held in Tempe, Arizona, on March 2–4, 2000. Sponsored by the Association of American Universities, the Association of Research Libraries, and the Merrill Advanced Studies Center of the University of Kansas, the meeting was held to facilitate discussion among the various academic stakeholders in the scholarly publishing process and to build consensus on a set of principles that could guide the transformation of the scholarly publishing system.

The creation, dissemination, and application of new knowledge are fundamental to the development of an informed citizenry and a healthy global economy. Institutions of higher education exist to fulfill these functions. From the lab to the classroom to industry to the public, the advancement of knowledge through research and teaching is an invaluable contribution made by higher education to the public good. Scholarly publishing is the process through which newly discovered knowledge is refined, certified, distributed to, and preserved for researchers, professors, students and the public.

The current system of scholarly publishing has become too costly for the academic community to sustain. The increasing volume and costs of scholarly publications, particularly in science, technology, and medicine (STM), are making it impossible for libraries and their institutions to support the collection needs of their current and future faculty and students. Moreover, the pressure on library budgets from STM journal prices has contributed to the difficulty of academic publishers in the humanities and social sciences, pri-
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mainly scholarly societies and university presses, to publish specialized monograph-length work or to find the funds to invest in the migration to digital publishing systems. Numerous studies, conferences, and roundtable discussions over the past decade have analyzed the underlying causes and recommended solutions to the scholarly publishing crisis. Many new publishing models have emerged. A lack of consensus and concerted action by the academic community, however, continues to allow the escalation of prices and volume.

The participants in the Tempe conference came together with the hope of building consensus on a set of principles that would inform the design and evaluation of new systems of scholarly publishing. The goal was to provide guidance while leaving open to creativity and market forces the actual development of such systems. The following set of principles is the result of their discussions. While the principles and their explanations reflect a North American perspective, the participants recognize that the advancement of knowledge and scholarly publishing are international enterprises. While the academic community in North America may agree on collective action, international discussion and support will be needed for the success of any new systems.

The participants encourage broad discussion and endorsement of these principles by institutions of higher education, scholars, scholarly societies, and scholarly publishers. Endorsement carries with it the commitment to implement local actions that will bring institutions of higher education closer to the goal of providing access to all relevant published research across all disciplines to all faculty by way of systems that ensure dependable management and affordable access to information over time.

*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. Members of the university community should collaborate to develop strategies that further this end. Faculty participation is essential to the success of this process.*

With the creation, dissemination, and application of new knowledge central to their mission, institutions of higher education must work to create systems that will provide affordable access to all relevant published scholarship across all disciplines for researchers, teachers, and the broader public. To do this, faculty, university administrators and professional societies must work together to create the systems that will contain, and in some cases, reduce substantially the costs of scholarly publishing. Since every faculty member should have access to all the relevant published research in her/his area, it is imperative that we find ways to bring down the cost to accommodate the expanding volume of publication within available budgets. The business arrangements of the journals for which faculty write, edit, and review must become a major focus of contributors, editors and readers if scholarly publication is to become affordable again.

Containing costs might be accomplished over time within the current configuration of scholarly communication through the effective use of technology to streamline publishing functions, while increasing access and value. Such systems have been developed within the not-for-profit community by Stanford University’s HighWire Press and The Johns Hopkins University’s Project Muse; other efforts, such as BioOne, are being facilitated by SPARC, the Scholarly Publishing and Academic Resources Coalition. One could also envision systems that would build peer-review and abstracting and indexing functions on discipline- or institution-based e-print services. Such a system is being promoted by the Open Archives initiative, an effort that strives for compatibility among e-print services. Cost-containment should also continue through library consortial purchasing of electronic resources, a strategy that appears to be effective in lowering the unit costs of electronic information. Whatever the solution(s), cost must be made to fit within available budgets or the system will fail to provide the information to scholars that they need.

*Electronic capabilities should be used, among other things, to: provide wide access to scholarship, encourage interdisciplinary research, and enhance inter-operability and search ability. Development of common standards will be particularly important in the electronic environment.*

With the growing volume of scholarly research, it is increasingly difficult to uncover all of the relevant material published on a given subject. As more scholarship becomes available in digital form, this problem can be surmounted through powerful search systems, provided that technological and legal constraints do not prohibit such searches. Searching, navigation, and linking across titles and across disciplines is essential since many disciplines have multiple titles that serve them and many problems have multidisciplinary aspects that may lead a researcher to publications in fields as diverse as microbiology, law, economics, and internal medicine. The development of standards is critical to the implementation of cornfield searching and navigation. In addition, given the importance of older literature to the advancement of new knowledge, retrospective works should be digitized and made accessible online.

*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.*

The advancement of knowledge is dependent on access to prior scholarship. While research libraries, with significant support from the National Endowment for the Humanities, have made significant progress in preserving print publications, there is still a large proportion of unique printed material yet to be treated and a number of additional formats, such as videotapes, sound recordings, and film, whose preservation needs have yet to be addressed in any significant way. Electronic publishing adds yet another set of complex issues to the archiving and preservation of scholarly works. With libraries no longer owning copies and with the fragility of the electronic media, questions of what should be archived by whom and how are critical issues that need to be addressed. Despite many unanswered questions and unknown costs, archiving and preserving scholarly publications in all media are critical to any credible system of scholarly publication.
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 academic community relies on the judgment of peers when assessing the quality of faculty work. While core archival journals are expected to preserve the peer-review process, the scholarly community recognizes that the exact nature and methodology of quality assessment varies by discipline. Any evolving system of scholarly publication should allow for an evaluation process to take place as appropriate and should provide a transparent mechanism that informs the reader—an expert, a student, the public—of the nature of the evaluation the work has undergone in its various versions. This recommendation recognizes the development of discipline- or institution-based collections of articles which may go through different stages of review and where neither the hierarchy of existing journals nor the reputation of the publisher may exist as a signature of quality assessment.

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.

The role of copyright is central to the academic community’s mission of advancing knowledge. Members of the community are both creators and consumers of scholarly publications. As creators, faculty depend on copyright to protect the integrity of their work and on fair use to be able to use and incorporate the works of others with attribution in their own work. By tradition, faculty have transferred without direct compensation all of their copyrights to journal publishers in return for the wide distribution of their work. In some cases this tradition has resulted in the need for faculty to seek permission and pay a fee to use their own work in their research and teaching. If the academic community is to achieve its mission of advancing knowledge, it is critical that faculty authors retain the rights to use their own works in their teaching and in subsequent publications. Widespread adoption of university policies requiring faculty to retain such rights could provide individual faculty with the bargaining power to negotiate such agreements with publishers.

While this document concentrates on copyright and fair use of scholarly works, the importance of copyright and fair use go well beyond the scholarly publishing system. It is imperative that the academic community monitor and critically examine any new license arrangements or proposed legislation (whether it be copyright amendments or any body of law affecting intellectual property directly or indirectly) and take appropriate action to make sure that such arrangements or legislation do not upset the balance between owners’ rights and users’ exceptions to them that has been achieved in copyright law with its provisions for fair use and library and educational exemptions.

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.

By judiciously assigning the rights to their work, faculty members can help assure that scholarship remains affordably available to the community. In the publication process, faculty can choose to publish in journals whose access and pricing policies make their work easily and affordably available. All faculty members should know the cost of journals to libraries and should consider refraining from submitting their work and assigning copyright to expensive journals when high quality inexpensive publication outlets are available. In fields where alternatives do not exist, universities and scholarly societies should work with faculty to develop such outlets.

The time from submission to publication should be reduced in a manner consistent with the requirements for quality control.

In rapidly evolving fields, lags of 12 months or more mean that scholarly history rather than cutting-edge research is the subject of publication. If published scholarship is to be a useful building block, it is imperative that the lag between submission and publication be shortened as much as possible for each field. While a number of factors contribute to the lag—peer review, author’s changes, back and forth with editors—and are important to the quality of the final work, technology should be exploited to speed up the process where possible. For example, some journals have already designed systems that select reviewers based on workload and availability. In addition, a number of disciplines depend on e-print systems for quick distribution of their work.

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.

While a fundamental factor contributing to the rapid increase in the volume of published research is the rapid expansion of knowledge, the academic credentialing system encourages faculty to publish some work that may add little to the body of knowledge. In the spirit of creating an environment that reduces emphasis on quantity across the system and frees faculty time for more valuable endeavors, faculty in research institutions should base their evaluation of colleagues on the quality of and contribution made by a small, fixed number of published works, allowing the review to emphasize quality. This de-emphasis of quantitative measures could moderate the rate of increase in new titles and numbers of articles published. Some universities have already modified faculty evaluation in this manner and federal granting agencies, such as the NIH, have implemented policies to limit the number of articles cited in the grant application process.

In electronic as well as print environments, scholars and students should be assured privacy with regard to their use of materials.
The digital environment, in particular, makes it very easy to obtain data on users and use patterns, information that can have great marketing appeal. It is incumbent on the academic community to assure the privacy of individual users with regard to their use of scholarly publications or other source materials made available through our institutions, consistent with state and federal laws.

Signatories to Principles for Emerging Systems of Scholarly Publishing

Shirley K. Baker, Vice Chancellor for Information Technology and Dean of University Libraries, Washington University Libraries
Douglas Bennett, President, Earlham College
Myles Brand, President, Indiana University
Felix E. Browder, President, American Mathematical Society
Daryle Busch, President, American Chemical Society, Professor, University of Kansas
Jerry D. Campbell, University Librarian and Dean of Libraries, University of Southern California
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Gerhard Casper, President, Stanford University
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Alan P. Covach, President, American Institute of Biological Sciences, Professor, Colorado State University
Ronald G. Douglas, Executive Vice President and Provost, Texas A&M University
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Wyatt R. Hume, Executive Vice Chancellor, University of California, Los Angeles
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Richard Johnson, Enterprise Director, SPARC
Arnita Jones, Executive Director, American Historical Association
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