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Author
Woolums, Jill

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Scholarly Practices in a Globally Linked, Technology-Enhanced Academy

Jill Woolums

Introduction

This chapter concerns the relationship between interdisciplinary study and the issues of scholarly communication currently under critical debate. Both introduce new issues and challenges in the academy. Decisions made by universities with respect to each have the potential to make positive changes in the scholarly landscape. Not all parties involved with these issues, however, envision a bright future.

Defining the Landscape

Scholarly communication is the process through which scholars, educators, and researchers share their research findings with others. It involves the process of knowledge creation and discovery, reflects the interpretation and transformation of ideas, and involves publication and dissemination of knowledge as well as preservation of a record for posterity. Most significantly, scholarly communication entails a process of critical evaluation—a process through which ideas build upon ideas and knowledge grows.

Scholarly communication has a long history. It is not so much the quantity of information available, as the connectedness of that information through time and the achievement of knowledge that is of interest to scholars. Knowledge is more than information.

The substance of communication within the academy is scholarship. The *Oxford English Dictionary* defines *scholarship* as "The attainments of a scholar; learning, erudition; esp. proficiency… The status or emoluments of a scholar at a… university."[1] Scholarship determines scholarly status, which is achieved through evaluation among peers. To achieve advancement and promotion at colleges and universities, faculty are held to high standards of achievement, generally in four areas: teaching, research, professional leadership, and public service. At large universities in particular, research is of paramount

importance. The requirement to do research and publish the results, commonly known as "publish or perish," is the primary criterion for higher status and higher pay. The need to be published by reputable scholarly societies, commercial publishers, and university presses in an era of expansion of higher education has created a highly competitive environment. This competition impacts the crisis in scholarly communication. Publishers must meet the need to publish more. Scholarly societies, nonprofit organizations, and university presses must be highly selective and frequently face budgetary shortfalls that prevent them from meeting the volume of need. This overflowing volume has handed overmuch of the work of publishing to large-scale commercial publishers, which can and do meet the need, but at a significantly higher cost. The escalation in cost is at the root of the scholarly communication crisis.

Scholarly communication is in flux. Traditionally, researchers conduct their investigations according to methods acceptable to their disciplines. The results of research appear in published writings, conference presentations, lectures, and teaching. The delivery of research enriches disciplinary groups and spurs further publication. Historically, the primary formats of published scholarly works have been printed books, articles, dissertations, and conference proceedings. Authors seek prestigious publications, and publishers seek well-respected, well-known scholars.

With the Internet have come a glut of information and the challenge of finding, sorting and sifting through it. The Internet has introduced new formats: blogs, wikis, learning management systems, online discovery tools, electronic repositories, e-books, and e-journals. The Internet has made information, including scholarship, appear to be freely available "on demand." Scholarship, however, comes with a high price, primarily paid by libraries, whose funds are shrinking.

Academic communities are defined by the boundaries of disciplines, many of which date far back to the earliest days of human study and investigation. The evolution of scholarship follows formal methods of accepted practices imposed by academic disciplines. The scientific method may differ from poetic critique, but both are accepted as established protocols pertaining to their respective fields. All disciplines produce scholarship pertaining to their unique inter-

ests. A critique comparing the poetry of William Carlos Williams with that of T. S. Eliot is as important to the literary scholar as the scientific surveys developed by William Herschel in his discovery of Uranus is to an astronomer. Interdisciplinarity has been an influence as far back as the earliest days of scholarship. Undergraduate general studies curricula of many liberal arts colleges reflect this influence. Interdisciplinary work investigates a problem or issue from several perspectives. A group of scholars may study cancer in terms of its medical and psychological effects on an individual as well as its economic impact on a person, family, and society. The late twentieth and early twenty-first centuries have witnessed a significant increase in interdisciplinarity by faculty, graduate students, and other advanced researchers. Environmental studies, for example, combines the study of ecology, policy, law, sociology, public health, and natural resources. To solve the problem of pollution, scholars in all these fields come together bringing their expertise.

Barbara Leigh Smith, a proponent of interdisciplinarity, considers its role today in stating, "Interdisciplinary programs are different. They propose that there are priorities, relationships among the fields of knowledge. And they suggest that there are specific things that… [an educated person] should know and know how to do."[2]

The American Association of Universities studied successful interdisciplinary programs. Its study found that such programs (1) engage more than one discipline; (2) produce results that cannot be accomplished by a single discipline alone; (3) are situated at the boundaries among fields (for example, biophysics); (4) focus on large-scope issues related to several disciplines; (5) employ a common tool; and (6) provide opportunities for multi-institutional collaboration.[3]

Michael Moran raises the political aspect of interdisciplinary studies:

> The disciplines have been greatly strengthened in recent decades, and the interdisciplinarity can partly be understood as a response by interests threatened by disciplinarity. It is also a strategy used by disciplines in crisis, and by dissidents from disciplinary hierarchies.… Disciplines therefore are about power, hierarchy and control in the organization of knowledge.… Academics have ensured

that evaluation is dominated by peer review.… Dominant disciplinary paradigms shape the most highly regarded scholarly work. The outcomes, and the consequences of the outcomes, have in turn reinforced hierarchy, by awarding the highest grades to the elite institutions that entered the process with the largest endowments of cultural and material capital.[4]

Moran indicates that interdisciplinarity's goal of problem solving is viewed as less "scholarly." Academics pursuing interdisciplinary research may be seen as outsiders, while such academics may see themselves as innovative, visionary, or representing a newer generation of thinking. Holley indicates that the "challenge of interdisciplinarity engagement is related to the need for organizational transformation… [and must be] cultivated through well-organized efforts to draw scholars outside their disciplinary domains and reward endeavors that do not always align with the traditional norms of higher education."[5]

The increasing emergence of interdisciplinarity places additional demands on the already stressed scholarly communication system. Interdisciplinary projects seek recognition and outlets for publication. The Center for Studies in Higher Education concluded that

there is a need for a more nuanced academic reward system that is less dependent on citation metrics, slavish adherence to marquee journals and university presses, and the growing tendency of institutions to outsource assessment of scholarship to such proxies. Such a need is made more urgent given the challenges to institutional review of assessing interdisciplinary scholarship, new hybrid disciplines, the rise of heavily computational sub-branches of disciplines, the development of new online forms of edition-making and collaborative curation for community resource use, large-scale collaboration, and multiple authorship.[6]

As current models of peer review are being challenged because of their impact on escalating cost, the academy also needs to develop models for assessing interdisciplinary scholarship so as not to unduly increase the amount of publishing and not to disadvantage scholars.

Lee indicates that peer review of interdisciplinary publications requires the acknowledgment that reviewers cannot adequately review for impact and validity outside their own areas of expertise. He suggests that new editorial policies be developed and that

> reviewers should be instructed to confine their comments to their area of expertise, to raise questions before making a judgment, and should be asked explicitly whether they have performed the specific type of analysis used in the manuscript, on the specific type of data it presents. Editors should pay close attention to classic signs of field bias, such as reviews that avoid discussing the paper's actual data; largely speculative criticisms not supported by specific data or literature; or lack of evidence that the criticisms are actually relevant to the specific data in the paper.[7]

This additional work requires more time, money, and expertise, adding more stress to scholarly publishing.

Administrators of large institutions have their own agenda in their support of interdisciplinarity, often in conflict with established faculty. While status is of paramount importance to administrators, their need to meet certain bottom-line goals stems largely from political obligations to government agencies and boards of trustees and from economic ties to corporate and influential private donors. Their perspective, more fully examined below, is generally more favorable toward interdisciplinary programs.

The Players

The key players on the scholarly communication landscape frequently see the issue through narrowly focused eyes. Solving today's crisis in scholarly communication requires an understanding not only of each stakeholder, but also of the interdependency among them. Understanding this interdependency and how individual players' needs often collide is necessary.

Faculty

Faculty are the creators of scholarship. Their research and productivity provide the content transmitted through scholarly communication

and publishing. Creation of scholarly content is mandatory for faculty to rise up the ladder of tenure and promotion. Savage indicates: "Whereas insufficiently productive junior faculty may be denied tenure and promotion, senior faculty may be threatened with loss of sabbatical leave or with a heavier teaching load to compensate the school for their failure to publish enough."[8]

Some disciplines, particularly the humanities and social sciences, require book publishing. The urgency for book publishing derives from the department's and university's need for prestige. Savage indicates that "the important thing, the thing from which the prestige of department and university derives, is publication."[9] Sales, cost, and readership are important factors to scholarly publishers that seek economic viability or profit and to libraries dealing with shrinking budgets and shelf space restrictions. These needs place significant pressures on the flow of scholarly communication in the academy.

Journal article publishing is especially important in the physical sciences. The Ithaka *Faculty Survey 2009* found that traditional channels of communication, not new forms such as blogs, Twitter, digital content repositories, "remain the most important ways in which faculty communicate both formally and informally."[10] The study found that from 2003 to 2009 and across disciplines, over 80 percent of faculty studied indicated that "the single most important factor in selecting where [i.e., in which journal] to publish is consistent readership within one's own discipline."[11] It also found that tenure and promotion are faculty's highest priorities, not other activities such as new online forms of communication, open access publications, or free availability of resources. Journals with longstanding reputations of high quality and widespread readership within a discipline remain all important, even in science fields where there is significant depositing of articles into repositories.[12] Traditional publications will dominate scholarship dissemination because "career incentives based on traditional practices are likely to continue, unless there is an overall cultural shift and structural change driven from the highest level of academic administrators."[13] The assessment and status needs of interdisciplinarity could influence a shift. Schonfeld and Housewright also suggest: "Further exploration of the possible ways in which information services organizations can help faculty to maximize the value and impact of their re-

search is certainly called for."[14] How libraries might "maximize" needs further exploration.

Publishers

The Ithaka study ends with questions, including some for publishers. "How can publishers enable faculty members to maximize the visibility of their research outputs in an environment where almost limitless information competes for our attention? Will faculty members continue to value traditional services from their societies as the digital revolution continues, and what new services [from publishers] might evolve?… And, will faculty be able to move beyond publishing practices that are 'unnecessarily constrained' by tenure and promotion processes?" The study concludes that "support of trailblazing faculty disciplines may help these institutions develop the roles and services that will serve a growing range of faculty needs into the future.… Institutions [must] ensure that the 21st century information needs of faculty are met and to secure their own relevance for the future."[15] Can interdisciplinarity provide these "trailblazing faculty disciplines"?

Miller and Harris note that most scholars are rarely concerned with the price of a journal subscription, despite the fact that they are the ultimate consumers. There is therefore a "disconnect between those who pay for information and those who consume it, along with the disconnect between those creating the information and those generating monetary profit from it."[16] To make a profit, publishers increase the number of sales or increase prices. To justify prices, publishers increase number of pages or provide enhanced technology. They also bundle subscriptions into packages, forcing libraries to purchase more than they need. However, escalating prices, coupled with severe cutbacks in budgets, are forcing libraries to cancel subscriptions and forego packages altogether. Commercial publishers eagerly publish high-quality research, but are not inclined to improve the publication process, nor are they "inclined to be innovative unless innovation leads to increased revenues."[17] Corporate publishers serve shareholders and monitor success through "surveys of authors and readers, citation statistics, and trends in rates of submission, publication, and efficiency of the review process."[18]

In the era following World War II, research funding expanded, and with it came an explosion in the volume of published material. Because of the need to publish, scholars turned to commercial publishers when society publishers were unable to handle the volume.

> Commercial firms found there was money to be made publishing the overflow of articles that couldn't be accommodated in society journals.… And since they were incentivised to maximize profit… they raised institutional prices dramatically and relentlessly.… With this foot in the door, commercial publishers built substantial portfolios of journals, aided by a trend of society "outsourcing" of their journal publishing to commercial firms. The high corporate profits from these journals have funded aggressive programs of internal development and wave upon wave of acquisitions and consolidation among publishers.[19]

While internal development provides technological platforms that facilitate the delivery and discovery of knowledge, libraries must weigh these services against the strangling price structures that come with them.

Conley and Wooders conclude that commercial publishers are no longer necessary, and that "in the electronic era, commercial publishers only impede distribution and add insult to injury by charging huge fees for their trouble."[20] After creating an open access scholarly journal in economics, they concluded that all of the traditional services expected of publishers, including printing and binding; typesetting; advertising; secretarial; postage; editorial salaries; referee stipends; and author publication fees are no longer necessary in the electronic environment. The only services for which they see a need are the Internet-based workflow/content-management systems and the software technicians to run them. Their article fails to acknowledge the sophisticated search engines publishers have developed and lacks perspective on the enormous scale of academic publishing and the challenges of accessibility. They also lack a wider view of the complexity of interests involving multiple stakeholders. They do recognize the favorable impact of open access: "Open-access is consistent with our mission as scholars to increase and spread knowledge and also feeds

our personal and professional interests much more directly. However, we are still largely living the system of scholarly communication we inherited from the papyrocentric era. This system will not go quietly into the night. Commercial publishers will do their best to hang on to and exploit this inherited capital as long as they can."[21] They acknowledge the tenure-promotion impediment, noting that scholars seek the "most reputable journal… whether this location is an open access journal, a cheaper society journal, or an expensive commercial journal."[22] Although the authors fail to see beyond the paper versus digital debate, they do recognize the crippling economic posture of commercial publishers and propose new entrepreneurial ventures. How these entrepreneurships will function, what services will they provide, how will they be paid and how much, what will prevent them from escalating up to the scale of large commercial publishers when they see the potential of deep pockets to pay them, and what deep pockets will remain solvent enough to employ their services remain unknown. In a broader sense, the success of small ventures is part of the larger economic debate focused on the need for the survival of small, local business in a world dominated by large, global, multinational corporations. The authors fail to discuss the role of libraries, but do hint at the role interdisciplinary programs may play in saving scholarly communication. They indicate that the stability of the status quo will be maintained until "new fields arise and old ones fall out of favor [and] there is opportunity to overturn this historical fact.… Patience is required."[23]

Withey et al., representing the view of university presses and book publishing, addresses the issues differently. They state that the scholarly publishing "system" must "confront the high cost of the front-end of the process: acquiring, peer-reviewing, and editing manuscripts. Second, we must stop being obsessed with output, because format—print, electronic, article length, book length—is rapidly becoming a non-issue.… And finally, since scholarly publishing is a system involving many players, it must be analyzed as a system. No one player can resolve this crisis alone."[24] University presses, as book publishers, must focus increasingly on the bottom line, as institutional funding decreases and demand for publishing manuscripts increases. They recommend a realignment of journal-

and book-publishing efforts to better integrate new technologies and institutional repositories into the system as a whole and teamwork among the players. The recommendations of Withey et al. deserve further study and planning.

Academic Institutions and Administrators

In their book, *Engines of Innovation,* Thorp and Goldstein, both university presidents, examine institutions of higher education in the current fiscally challenged economy.[25] Like Conley and Wooders, they favor entrepreneurial ventures to solve the problems of society and the academy. Thorp and Goldstein see through the eyes of high-level administrators who are accountable to interested parties outside the academy; namely, government, the corporate sector, private philanthropists, and the public. There is little mention of the full scope of services their constituents such as faculty and libraries provide or the issues they face. Taking their cues from Google's Eric Schmidt and Harvard's Michael Porter, they believe that innovation with the nation's great universities leading the way and a comprehensive economic strategy should create the path to a better future.

Thorp and Goldstein see positive implications for interdisciplinary research: "Problem-based innovation in research universities can focus resources from a variety of disciplines on the challenges we face and, in so doing, create new knowledge and economic growth."[26] They also recognize that interdisciplinary research may attract new money for their institutions. Funding sources (i.e., private philanthropists, government grantors) want solutions to BIG problems and are "looking for a measurable return on their investment. It is no longer merely desirable for universities to be the source of innovations. It is now a national priority."[27] Universities are already organized to do the job because they contain "scientists, artists, poets, designers, computer programmers, venture capitalists and entrepreneurs" with the skill sets to address the problems. Thorp and Goldstein want their institutions to find answers and solutions and not cede this role to the private sector and government. They want the academy to embrace "high-impact innovation [that] requires an entrepreneurial mindset that views big problems as big opportunities."[28] By nature, interdisciplinarity has this problem-based focus

and brings together the talent and perspective of several disciplines to tackle big problems.

Thorp and Goldstein do not explicitly address the crisis in scholarly communication. However, they see Google as providing an answer:

> Google is spending billions on efforts to put the world's great libraries online, and hundreds of other efforts are aiming to include not only text but audio and video in the new electronic canon—and all of this will be updated in real time. At the most basic level, access to the world's knowledge is being democratized. Although the economics have yet to be worked out (fertile ground for entrepreneurial thinking), what only a few years ago seemed to be a futurist's musing is now happening, and anyone who doubts the new reality should have a look at Google Scholar, the forerunner of the promise of universal knowledge access.… Physical and economic barriers to the free flow of knowledge are going away.[29]

Have they even heard of Elsevier? Thorp and Goldstein fail to see the bigger picture. They demonstrate how stakeholders lack understanding of each other when they state that "the economics have yet to be worked out," that Google Scholar promises universal knowledge access, and that economic barriers to the free flow of knowledge are going away. They lack awareness of the economics of, demand for, organization of, and access to recorded scholarly knowledge. They fail to understand their libraries. They appear unaware of the many entrepreneurial collaborative ventures evolving and already entered into by libraries. Libraries have done such an excellent job at providing "feels like free" resources that they escape notice by primary users.

The authors herald interdisciplinarity as representing entrepreneurial thinking, but fail to see how "entrepreneurial thinking" of their institutional constituents offers hope for positive change. Library entrepreneurial thinking has created repositories, led to archival collaborations such as Western Regional Storage Trust, and resulted in cooperatively developed discovery tools (e.g., OCLC's WorldCat).

Commercial publishers have demonstrated little entrepreneurial thinking regarding economic sustainability in scholarly publishing.

They, along with Google, have incentive only to profit from content digitization. For sustainable scholarly publishing to occur, entrepreneurial thinking must address the conflict between profit-motivated providers and its primarily nonprofit marketplace.

Libraries
Libraries are inclusive with respect to interdisciplinary programs.

The mission of libraries is inherently interdisciplinary. Libraries do not discriminate adversely against any particular field of scholarship. Instead, libraries seek to preserve the whole scholarly record, including all disciplines, regardless of format, be it digital, print, or another medium. Although academic libraries must evaluate quality and live within budgetary constraints, it is their purpose to create collections that match the depth and breadth of academic programs. Libraries' efforts, therefore, benefit the long-term success of interdisciplinary scholarship by preserving its record. When a university deems a research discipline or project important enough to fund, libraries will similarly allocate or reallocate funds to assure access to the published results of such research. Although librarian-selectors align with disciplines, they will add interdisciplinary materials to their collections if faculty demand and supporting funds exist. Budgetary restrictions, however, can create competition for available funds.

As faculty become aware of the economic challenges of scholarly publishing, they recognize libraries' role in purchasing information. Libraries have budgets for buying books and licensing subscriptions, whereas faculty do not. The role of libraries' discovery tools has diminished in the Google era. While there has been an explosion of new discovery tools created by commercial enterprises and sold to libraries for their users, Google, through its name brand, has claimed market dominance in search with its common search engine and Google Scholar. Commercial products sold to libraries, such as EBSCO's Discovery Service and Serial Solutions' Summon, attempt to compete by providing added search functions and deeper indexing. Google, as essentially a marketing tool, markets library catalogs and collections much as it advertises other commercial products. Administrators such as Thorp and Goldstein fail to recognize that libraries pay, Google does not. This gap in awareness persists in the academy.

Google Scholar pales in comparison to the sophisticated search engines developed by commercial publishers. While gaining in breadth as more publishers permit Google to market their articles, Google's search engine does not provide the depth or refinement of search engines developed by large publishers such as Elsevier, ISI, CSA, and EBSCO. Fortunately, library budgets still buy these higher quality search engines for their users, although budget shortfalls in the current recession have led some to cut back on the number of available search engines. How budgetary shortfalls and publishers' economic conditions will impact the future of quality discovery tools remains unknown.

Libraries make informed decisions about their acquisitions based on usage statistics, circulation records, faculty input, citation reports, cost data, and other metrics. In dealing with commercial publishers, Miller and Harris note that the "complexity of negotiations with publishers over electronic content in an industry devoid of any standards is a mounting concern."[30] To compound matters further, published knowledge is increasing in volume faster than ever before, making it difficult for library budgets to catch up. "Since the beginning of the twentieth century the trend has been a rough doubling of knowledge every fifteen years."[31] Shared purchasing among libraries holds some hope for the future. Libraries have struck back at impossible price demands by forming consortia to increase their bargaining power and gain economies of scale.

Libraries have certainly embraced entrepreneurial thinking in the areas of archiving and preservation. Some have procured perpetual rights to preserve digital archives as they have preserved print for generations. Although Google is recognized by the general public for digitizing books (taken freely from major libraries), research libraries have made huge strides toward digital preservation of both printed resources and born-digital materials.

Organizations like LOCKSS, Portico, and JSTOR are engaged in collective problem solving to preserve digital records, and academic libraries have cooperatively made these efforts possible. WEST, initiated by the University of California, strives to ensure adequate preservation of print materials, in sustainable numbers, for several Western universities.

The entrepreneurial efforts of libraries in the past two decades have been considerable. In addition to innovative digital and print archiving and preservation strategies, cooperative purchasing endeavors and collaborative discovery tools continue to evolve. As partners in creating institutional repositories, libraries stand at the forefront of the scholarly publishing debate as leaders in addressing the scholarly communication crisis.

Impediments and Opportunities

Interdisciplinarity presents scholarly communication with both obstacles and opportunities. The way to removing barriers to the creation and preservation of interdisciplinary collections requires the involvement of multiple interested parties. Interdisciplinarity adds more to a rapidly increasing volume of research that must be vetted, published, and purchased. This means new faculty attitudes and skills and sustainable publishing models that include cost -effective production and market-supported pricing. Faculty must value interdisciplinary research, administrators must recognize the prestige interdisciplinary programs can bring to their institutions, and funding sources must see the positive impact of these programs. Successful academic and economic models of scholarly communication mean addressing the scholarly communication/scholarly publishing system as a whole. Publishers, corporate aggregators, researcher-authors, libraries, and technical infrastructure developers must be aware of the needs of each other. Stakeholders both in interdisciplinary studies and in scholarly communication must not only reach their own goals, but also understand the impact of their actions on others. This need for communication suggests the need for more forums, panels, meetings, summits, and cross-attendance at conferences among the parties. Beyond discussions, action plans, guidelines, and commitments need to be established.

Faculty Tenure and Promotion

It would be easy to blame the crisis on the traditional faulty approach to tenure and promotion. Tenure and promotion will not disappear. New solutions require a new approach. At present, there are more questions than answers. Can faculty find other ways to evaluate their

peers without creating excessive numbers of books and articles? If so, will this alleviate the economic stranglehold of commercial publishers? Will faculty become willing to publish in open access journals and e-books? Will the open access model succeed as a viable economic model? Will disciplinary faculty become more open to interdisciplinary programs? What will motivate this openness? Will universities receive more money for institutionally based scholarship that crosses disciplinary lines? Will this funding elevate the status of interdisciplinarity?

Interdisciplinary faculty gain institutional support by attracting money from corporate, governmental, and philanthropic sources wanting BIG problems solved. Will such strong support make them less dependent on traditional protocols and motivate them to introduce new models of peer evaluation, less financially burdensome to the scholarly communication system? Will disciplinary faculty become less threatened if new programs are financially self-sufficient and distribute extra funding to participating disciplinary faculty? Will departments accept new peer-evaluation models necessitated by interdisciplinarity? Will interdisciplinary researchers adopt more cost-effective models of publishing, using new technologies and perhaps grassroots venues, and be less in need of commercial publishers?

A recent CSHE study found that conservative values prevail. Most faculty still conservatively cling to the traditional peer-review system to achieve stature and recognition. "Although there is a universal embrace of the rapidly expanding body of digital 'primary' sources and data, there is an equally strong aversion to a 'glut' of unvetted secondary publications and ephemera. The degree to which peer review, despite its perceived shortcomings, is considered to be an important filter of academic quality cannot be overstated."[32] The report acknowledges new platforms, including Web 2.0. "It is also possible, based on our scan of a variety of 'open peer-review' websites, that scholars in less competitive institutions (including internationally), who may experience more difficulty finding a high-stature publisher for their work, will embrace these publication outlets. Time will tell."[33] In addition, "Experiments in new genres of scholarship and dissemination… are taking place within the context of relatively conservative value and reward systems that have the practice of peer review at their core.…

We have found that young scholars can be particularly conservative in their research dissemination behavior."[34] Interdisciplinary researchers, even more than their established peers, need to compete for academic status. Although the appeal of less prestigious open access publishers may be attractive to them to make their work accessible, they must also be cautious to not be seen as part of the glut of low-quality information inundating the Web. They also will not want to be seen as aligned with less respected institutions as they compete for placement in higher-ranked academies. Peer review of interdisciplinary research usually requires disciplinary faculty to parse out and evaluate material according to the protocols of their own disciplines. Interdisciplinary researchers, therefore, are dependent on a very traditional system to establish themselves as nontraditional scholars. As interdisciplinary faculty become more established, however, they have an opportunity to once again think outside the box, that is, to invent new protocols for peer review much as they have created new cross-fields of study.

Publishing Business Models

Publishing business models consist of strategic silos and bundles, price escalation, and rigid pricing. Again, questions abound. Will commercial publishers ever lower their profit margins in order to keep buyers? How strapped will libraries need to become and how many cancellations will they need to undertake to trigger the weakening of these corporate giants? Without library purchases, will commercial publishers devise new models directed toward individual scholar consumers? Will they be forced to unbundle for individuals what they refuse to unbundle for institutions? Will the needs of the interdisciplinary community require significant repackaging of products and services? Although no answers are yet apparent, it is clear that continued economic pressure, on all sides, will be a primary driving force toward new, perhaps unforeseen outcomes. Those visionaries who create innovative business models may be in the best position to endure.

Digital technology has also brought turbulence, created new user expectations, and introduced new players into the system. The 2010 report by Bain & Company indicates that the stakeholders in the publishing ecosystem are facing "the redistribution of value among play-

ers, a redesign of their roles and, potentially, an evolution in the way content is created—all of which could produce significant new value for the industry in the long term."[35] In addition, "Regardless of device, consumers today expect ubiquitous, instantaneous and free information."[36] Interdisciplinary scholars have an opportunity to embrace new technologies to spread access to their research.

The Bain report recognizes the emergence of powerful digital distribution platforms and Amazon and Google stepping into the role of reader advisors. It predicts an acceleration of the "consolidation of distribution networks around the players with the greatest economies of scale.… Even more fundamentally, new technologies could loosen the control that publishers have over the entire value chain. To maintain their leading role, publishers must not only redeploy resources to digital channels, but also create new services for authors and readers alike.… Emerging authors may value publishers that can provide online and physical marketing and distribution services."[37] These predictions shed light on opportunities in the scholarly communication "ecosystem" as well. Will commercial publishers lose their competitive edge if newer publishing models evolve that satisfy vetting requirements, ease of dissemination, and cost-efficiencies and that financially reward authors? Perhaps the real question is how will such new publishing models evolve? With what institutional or venture capital will their start-ups be funded? Who will lead these efforts—societies, faculty, interdisciplinary programs, libraries, university presses, Amazon, others?

Emerging interdisciplinary authors need new publishing venues. They are positioned for innovation, if not leadership. They straddle and unite disciplines. They connect institutions. They are in a position to influence disciplinary peers by demonstrating successful alternatives. For example, a project that brings together leading thinkers from environmental science, medicine, and social work who represent institutions such as Stanford, Harvard, NIH, Oxford, and the University of California and that has done groundbreaking problem solving stands in a position of power. What it says has credibility and will get noticed. As groundbreakers, they more urgently need to create their scholarly record. This need creates the kind of motivation that could successfully develop new publishing models.

Despite conservative tenure and promotion attitudes, interdisciplinary researchers may be more willing to publish outside corporate boundaries and therefore be more willing to pursue open access and newer publications and publishers if traditional vetting is maintained and high-level credibility exists. They could take the lead in creating less costly, more accessible dissemination models. Assuming their research to be in high demand—since their work spans disciplines and satisfies outside interest groups—they may have leverage in initiating change. If they are successful in achieving prestige, their efforts could lead to new directions in scholarly communication as a whole.

Cooperative publishing is an alternative model. Instead of egregious price setting and out-of-line profit motives, cooperatives offer a more democratic method for the producers and consumers of scholarship to serve themselves. Schroeder and Siegel indicate democratic control and limited return on investment "would assure that prices rise only enough to cover expenses… [and] return on investment will primarily come in continued lower prices for our quality scholarly product."[38] Schroeder proposes that cooperatives could be formed by groups of related scholarly societies willing to "take back" their journals from commercial venues. Cooperative publishers look favorably on open access—something that would considerably ease strained library budgets. Co-ops could provide valuable assistance to start-up publishers.

> Historically, the society model of publishing came very close to the cooperative model, in that profit was not generally a motive and the academic producer/consumer engaged in all five of the major facets of production and distribution, especially if the society publication was based at an academic institution. When production and distribution became too burdensome, however, many societies turned these aspects over to commercial entities, and the model became less cooperative. Now that all these processes can be carried out electronically, however, the time is ripe for a more radical paradigm shift than what is offered by many of the "open access" models we are now seeing.[39]

One such co-op on its way to success is the German Academic Publishers Project. What needs to happen to encourage more such co-

ops? What will persuade societies to take back control? Can university presses achieve advantages by adopting a co-op model as institutional support wanes? Perhaps large-scale interdisciplinary, multi-institutional projects could publish their own work much in the way societies have done or develop their own sustainable, cooperative models of publishing and dissemination.

New Roles for Libraries and Librarians

Libraries face budgetary impediments. Budgets have been cut severely while the volume of scholarship is escalating. They must buy more with less, demonstrate relevancy as their services are usurped by search engines and new reader advisors, advocate for change, adapt to technologies that make their services obsolete, and remain committed to quality selection, stewardship, and preservation. In addition, they must also persuade their institutions and faculty of their continuing value and remain as resilient and focused through this turbulent period as in the past.

The Challenge of Continued Relevancy

Faculty, institutions, and publishers recognize libraries' role in purchasing scholarship. This role will likely be more significant in the decade ahead. Universities must buy, and libraries perform this duty. They will, however, need new skills and alliances to succeed in navigating the unknown road ahead.

Embracing Interdisciplinary Studies

Libraries must address issues similar to their institutions to support interdisciplinary programs. The 2005 Association of American Universities study of interdisciplinary programs found key questions to be addressed in creating successful interdisciplinary programs.[40] These questions have corollaries for libraries.

Should the selection of interdisciplinary material be assigned to a bibliographer who is aligned with a discipline, or are there funds to support a new hire? To promote cooperation and minimize competition, bibliographers from different disciplines may need to agree upon shared and separate responsibilities with respect to supporting such programs. A clear structure should be established. Should a lead

bibliographer be appointed? What will be the reporting lines? Library administration will need to provide support, via promotion and advancement, for affected bibliographers.

Clear delineation of funding is needed. What funding model best suits the budgets of impacted bibliographer groups? How might cost sharing be implemented? Is there a need for soliciting donor or grant money? Evaluation procedures need to be established, especially if an interdisciplinary program has a sunset provision. Bibliographers should decide on criteria to be used to evaluate the usage of these interdisciplinary collections.

As librarians develop relationships with interdisciplinary researchers, they may encounter fertile ground for advocating cost-effective models of scholarly publishing. Libraries may receive new institutional funds to support interdisciplinary studies and discover they need to spend comparatively less on interdisciplinary materials because of their availability via cost-efficient models. Libraries may find new partners willing to step forward to create vetted repositories assured of longevity by preservationists. These models may serve as exemplary innovations that can be replicated in other disciplines.

Librarians and interdisciplinary faculty could become strong partners in achieving cost-effectiveness, institutional prestige, and entrepreneurial success.

New Skills to Master

Librarians need new skills to achieve their goals in the current economically and politically challenged academic climate. As non-profits, libraries must negotiate with for-profit information providers. They must enter into new partnerships and alliances to find strength and bargaining power and solve the big problems of scholarly publishing. Large state consortia have already formed in states like Ohio and California, and other research libraries have formed regional consortia, such as Lyrasis and the Association of Southeastern Research Libraries. Librarians must maintain strong relationships with faculty for the achievement of common goals. They need to support cost-effective publishing by collaborating with university presses, building institutional repositories, and pursuing new publication models. They need to be effective advocates, not

only for the value-added services they provide, but also for change in protocols that will assure an excellent scholarly record for generations to come.

Librarians as Negotiators

Librarians need persuasive negotiation skills now more than ever. Historically, libraries collaborate and cooperate. The vast interlibrary loan network demonstrates this. Now, however, they must negotiate with large corporations whose staffs possess skillful strategic marketing and sales expertise and whose bottom line is their corporate mission. Library schools have not taught classes in business skills like negotiation and marketing. In the future, however, development of these skills will impact libraries' fiscal capacity and operational strength. On-the-job training is needed to develop the business acumen for sustainable strategic planning.

Libraries as Publishers

Libraries have entered into significant partnerships and collaborations in recent years. They collaborate with university presses. They cooperate in building institutional repositories and in creating common tools to facilitate research discovery. For example, WorldCat has now integrated OAIster, formerly a repository of repositories from institutions worldwide. They can partner in new cooperative models and urge faculty, scholarly societies, and interdisciplinary centers to innovate with open access or other cost-efficient methods of publishing.

Librarians as Liaison

Librarian-faculty relationships remain critical. These relationships may need to become more strategic as financial pressures impact all segments of the academy. As librarians embed themselves into curricula, they have opportunities to inform faculty about the crisis in scholarly publishing. Exerting influence in a collaborative atmosphere can serve them well when advocating for alternative models of scholarly publishing.

Librarians as Advocates

Navigating the issues of scholarly communication is becoming a core

responsibility of librarians. This is likely to increase as economic challenges persist. It demands excellent business, leadership, and entrepreneurial skills. While they advocate for their own survival, they must advocate for change. Libraries need marketing and public relations programs to better promote their value and services. They must be ready to respond to the questions of their institutional administrators, faculty, students, and the general public. When institutions are funded by tax dollars, libraries are also accountable to government. Libraries need to be ready with facts, data, stories, and evidence-based research to succeed in accomplishing their operational agendas.

Through cooperative ventures, libraries demonstrate alternatives to commercial models. Preservation beyond the borders of local institutions is increasing. Collaborative organizations, such as JSTOR, Portico, LOCKSS, and WEST, strengthen the position of libraries and remove these functions from commercial enterprises less inclined to serve a common good for posterity.

Persuasive advocacy requires a skillful Web presence within the academy and on the greater information landscape. Libraries need up-to-date infrastructures using advanced information technology to remain both relevant and competitive. OCLC has led the way in creating new tools and systems, but more is needed to compete with the research and development teams of corporate enterprises. Additional funding must be found to create these infrastructures. This compels libraries to become better fundraisers.

Libraries possess opportunities for leadership. While panels and conferences have been undertaken, new problem-solving roundtables need to strategize the path ahead. Libraries need strong allies. Partnerships with faculty, professional associations, university presses, scholarly societies, other libraries and consortia, and even commercial publishers would assure libraries' prominent role as a scholarly publishing stakeholder. Libraries need to seize the moment for leadership during this turbulent time. While contracting budgets are formidable, they also stimulate and motivate action toward a more sustainable future.

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