

Purdue University
Purdue e-Pubs

Charleston Library Conference

Is a Gold Open Access World Viable for Research Universities?

Greg Tananbaum
ScholarNext, greg@scholarnext.com

Carol Tenopir
University of Tennessee, Knoxville & Hanken School of Economics, Helsinki, Finland, ctenopir@utk.edu

Ivy Anderson
California Digital Library, Ivy.Anderson@ucop.edu

Follow this and additional works at: <https://docs.lib.purdue.edu/charleston>

 Part of the [Scholarly Communication Commons](#), and the [Scholarly Publishing Commons](#)

An indexed, print copy of the Proceedings is also available for purchase at:

<http://www.thepress.purdue.edu/series/charleston>.

You may also be interested in the new series, Charleston Insights in Library, Archival, and Information Sciences. Find out more at: <http://www.thepress.purdue.edu/series/charleston-insights-library-archival-and-information-sciences>.

Greg Tananbaum, Carol Tenopir, and Ivy Anderson, "Is a Gold Open Access World Viable for Research Universities?" (2016). *Proceedings of the Charleston Library Conference*.
<http://dx.doi.org/10.5703/1288284316481>

This document has been made available through Purdue e-Pubs, a service of the Purdue University Libraries. Please contact epubs@purdue.edu for additional information.

Is a Gold Open Access World Viable for Research Universities?

Greg Tananbaum, ScholarNext

Carol Tenopir, University of Tennessee and Hanken School of Economics, Helsinki, Finland

Ivy Anderson, California Digital Library

Abstract

Open access is at the heart of a seismic shift in scholarly publishing. In particular, gold open access (OA) has expanded at an accelerated pace, increasing in market share every year. In the gold OA model, financial viability shifts from the demand to the supply side, with article processing charges (APCs) a common scenario. Ideally, this model would be sustainable for academic research institutions, in that it would cost them cumulatively no more to pay APCs than they pay now in the traditional subscription model. APC-driven gold OA has financial and other implications for libraries, institutions, and authors. In the Andrew W. Mellon Foundation-funded Pay It Forward project, we examined the viability of gold OA by looking at institutional costs, faculty and graduate student opinions, and various models for gold OA. The Pay It Forward research teams gathered a variety of qualitative and quantitative data from publishers, research libraries, and faculty and students including current APC charges, current subscription charges, journal publication costs, opinions and behavior of graduate students and faculty members regarding publishing, reading, and OA.

Project Impetus

The Pay It Forward project began with an observation. It has become increasingly clear over a period of years that North America is primarily moving in a green open access (OA) policy direction, while policy developments in Europe and the U.K. are driving a conversion to gold OA. In other words, two of the largest research publishing economies in the world are working potentially at cross-purposes when it comes to open access developments. Together the United States and Canada comprise 31% of worldwide output, while Europe and the U.K. comprise 34%, meaning these developments could in fact be on a collision course.

These trends appear to be setting up a confused economic situation. License fees and article processing charge (APC) revenues are increasing; double-dipping opportunities abound through hybrid journals. Gold OA is now about 15% of all publishing worldwide, and it is projected to continue to accelerate rapidly over the next five years (Björk et al., 2010; Laakso & Björk, 2012; Laakso et al., 2011). Therefore, the project principals agreed that it would be useful to have a firmer grasp of these trends' implications.

The California Digital Library (CDL) began this process in an informal manner. In 2013, at the

request of the university librarians, CDL created some preliminary modeling of what the impact of a conversion to gold OA might resemble. After all, CDL licenses most of the journal content available system-wide at the University of California (UC). It had also been purchasing customized reports from Thomson Reuters about UC publishing rates in the journal packages that they license to inform their journal negotiations, so we had a good base of both financial and authorship data from which to work.

Preliminary calculations from this exercise were intriguing. They suggested that far from saving money if the world suddenly flipped to gold OA, the University of California might, in fact, spend more money on scholarly publishing but that gold OA might be affordable under certain conditions. Therefore, we began to wonder (A) if this quick and dirty analysis was correct, and (B) if it might also be true for other large, research-intensive institutions.

One of the challenges in exploring these issues is that there is plenty of opining about the viability of open access but much less objective analysis. Therefore, dispassion had to be a key pillar of the project. We wanted to stay away from questions such as, "Would society be better off in a fully OA world?" instead focusing on very practical, data-driven considerations.

Project Goal

The goal of this project can be distilled to one primary question: Can such a shift to gold OA be viable and financially sustainable for the institutions that publish the lion's share of research in the United States and Canada? It is important to note that we defined sustainability in this project as "costing those institutions roughly no more than, and ideally considerably less than, current journal subscription costs for comparable journals today, with a rate of growth that will be possible for these institutions to support over time." No matter how attractive the economics of OA might look from the perspective of the scholarly system as a whole, no institution will be incentivized to move in that direction if it isn't sustainable on a local level. As one of the largest public research institutions in the world, with a significant publishing profile—UC publishes something like 2% of the world's research literature—we had a real curiosity to figure out if a fully gold OA environment could be viable from the perspective of the big research school.

Team and Partner Roles

Because we did not want the project to be UC-centric, we engaged a set of partners from public and private institutions who share UC characteristics of high publication output. Thus, the Pay It Forward project includes Harvard University, The Ohio State University, and the University of British Columbia. The core project team consists of MacKenzie Smith, UC Davis, University Librarian and Project PI; Laine Farley, CDL Executive Director and Project co-PI until her retirement; Ivy Anderson, CDL Director, Collection Program and Project Quantitative Lead; Mathew Willmott, CDL Data Analyst; Carol Tenopir, University of Tennessee, who conducted the author opinion and behavior studies; David Solomon, Michigan State University and Bo-Christer Bjork, Hanken School of Economics, responsible for APC research; economist Mark McCabe, Boston University, who ran point on scenario modeling and economic analysis; and Greg Tananbaum, who served as project manager and contributed to the publishing economics section.

We had the further support of two industry partners: Elsevier and Thomson Reuters. They helped us directly with both bibliometric analysis and the provision of raw data, broken out by discipline, about both worldwide and institution-specific publishing outputs. Finally, the Association of Learned and

Professional Society Publishers (ALPSP), a society with some 300-plus member organizations including both the large commercial publishers and society publishers, assisted us with the publisher survey to gain a better understanding of publisher attitudes and strategic directions with respect to OA.

Key Project Components

The project was built upon qualitative and quantitative components, each data driven. We took this approach to ensure that we were not driven purely by economics but also took into account social and behavioral dynamics and values. From the qualitative perspective, we performed extensive survey and focus group work with faculty, grad students, and post-doctorates. We also worked with the Association of Learned and Professional Society Publishers to survey its membership. This gave us interesting and useful information about publisher attitudes and activities related to open access.

From the quantitative perspective, we performed a much richer and more detailed elaboration of the kind of modeling we had done earlier, examining publishing output and licensing costs under a variety of scenarios that were then informed by detailed research and analysis. Among the areas we delved into was a five-year deep dive into what the partner universities spent on scholarly journals from 2009–2013. We also thoroughly examined our partner universities' faculty publishing activities, including co-authorship patterns, availability of research funding, and growth over time, for this same five-year window. Additionally, we explored what the true cost of publishing is under the current environment by looking at dozens of publisher tax documents, real-world APCs for fully OA publishers, and previously published literature and analysis of this issue. Taken together, these data helped us build a set of financial scenarios, or models, depicting the implications an APC-based system of scholarly journal publishing for large research institutions. The Pay It Forward final project report may be found here: http://icis.ucdavis.edu/wp-content/uploads/2016/07/UC-Pay-It-Forward-Final-Report.rev_.7.18.16.pdf

What Do Faculty and Students Think of Gold OA?

The Author behavior team's role in Pay It Forward was to measure attitudes toward and knowledge of

gold open access (OA) among faculty and graduate students at participating research universities. To capture this information, we held focus groups in 2015 at The Ohio State University, Harvard University, University of California Davis, University of California Irvine, and the University of British Columbia. Each location held two focus groups, one for faculty and one for graduate students, and there was a total of 77 participants with 46 faculty members and 31 graduate students. These focus groups helped us to devise a survey that was then distributed at four of the five institutions. The survey had 2,021 responses for a response rate of 14.1%. The survey respondents were almost evenly split between faculty members (46.3%) and graduate students (45.3%), with a few post-doctoral researchers (8.4%). Of the graduate students, 80% were PhD students. Respondents were generally evenly distributed among subject disciplines, with slightly more coming from STEM disciplines. We also had a wide range of career ages. For faculty, the average year that they obtained their highest degree was 1955 (with a range of 1959–2015), graduate

students was 2016 (with a range of 2012–2023), and postdoctoral researchers was 2012 (with a range of 2002–2015). Almost all respondents had published articles in the last three years.

Attitudes Toward Gold OA

There is a wide range of opinions about gold OA, from the quite positive to the quite negative. This observation became evident early in the focus groups and then was clarified in the survey responses. The following comment is typical of those holding positive views of gold OA: A graduate student stated, “It matters heavily to me that my papers are open access. From my value standpoint, I care less about the impact factor, and I care more about having it peer reviewed but open access.” A few faculty members said that they would only publish in OA; the most common reason behind this decision was that it is more ethical to make result of research open. Several stated that they wanted to make sure that those without access to large library collections could still access research.

Table 1. Respondents’ subject disciplines by position type.*

Subject Discipline	Position			Overall Total
	Faculty	Graduate Student	Postdoctoral Researcher	
Arts & Humanities	197 56.3%	149 42.6%	4 1.1%	350 (17.3%)
Engineering & Computer Science	80 29.9%	170 63.4%	18 6.7%	268 (13.3%)
Life Sciences & Medicine	315 50.6%	208 33.4%	99 15.9%	623 (30.8%)
Mathematics	28 62.2%	12 26.7%	5 11.1%	45 (2.2%)
Physical Sciences	77 44.0%	75 42.9%	23 13.1%	175 (8.7%)
Social Sciences (including Business, Education, & Law)	236 43.0%	293 53.4%	20 3.6%	549 (27.2%)
Other	1 10.0%	8 80.0%	1 10.0%	10 (0.5%)
Total	934 46.3%	915 45.3%	170 8.4%	2019 100.0

*Only two respondents did not answer this question regarding position type or subject discipline.

On the other end of the spectrum, some respondents conflated gold OA with vanity publishing. One respondent explained, “If a particular venue becomes associated with a vanity press—if you have enough money, you can get it published there—then it loses credibility in academic circles or elsewhere.” Many of the concerns that did not conflate OA with predatory publishers largely saw article processing charges as a barrier to publishing, for themselves and for others. Most opinions, however, were neutral, and the more neutral attitudes toward gold OA may be better characterized as apathy. They had not thought much about the cost of publishing or prices of publications but instead, focused on publishing their research in the highest quality venue possible.

Factors in Determining Publication Outlets

In the survey, we asked respondents to rate the importance of a variety of factors in choosing a journal to which to submit or publish their work. Respondents were asked to rate the importance of each factor on a scale of 1–5 (1 = not important; 5 = very important). They were also given the option of “not applicable.” Open access rated the lowest in importance across all position types and subject disciplines (Table 2). Our recent article in *Publications* examines author motivations in choosing publication outlets (Tenopir, Dalton, Fish, Christian, Jones, & Fish, 2016).

Table 2. Ranking the importance of journal factors.

Factor	Mean
Quality and reputation of journal	4.69
Fit with scope of journal	4.61
Audience	4.49
Impact Factor	4.09
Likelihood of acceptance	3.74
Time from submission to publication	3.58
Editor or editorial board	3.42
Open access	2.84

* N = 2021

Perhaps because of the perceived stigma of “pay to publish” or predatory journals, or perhaps because the issue of open- or subscription-based journals did not resonate with many respondents, for most OA was not an important factor when choosing where to publish (Table 3.)

Although half of the respondents agreed or strongly agreed that more people would read and use their research if it were published in an OA journal (50.2%), almost as many felt that article processing charges (APCs) would limit their ability to publish (46.2%). Consequently, 40% of respondents would find other ways to publish. Only 33% of respondents agree that APCs are a reasonable alternative for publishing in an OA journal. Very few (14%) of respondents believe that APCs reflect the quality of a journal.

Table 3. Percentage of respondents’ agreement.

	Frequency	Percentage
More people would read and use my research.	764	50.2
APCs would limit my ability to publish.	718	46.2
I would find alternative ways to publish.	571	40.0
APCs are a reasonable alternative.	504	32.5
APCs reflect the quality of the journal.	185	13.9

How Much Are Researchers Willing to Pay?

We asked respondents how much they would be willing to pay in APCs based on different sources of funding, such as personal funds, discretionary research funds, OA publication fund through the library, department or other institutional research funds, grant funds, and other nonspecified funds. The majority indicated that they would be willing to pay somewhere between \$0 to \$499 (Figure 1).

Paying from personal funds is clearly unpopular. The library was the only source indicated by more than one-quarter of respondents to pay between \$2,000 to \$2,999. This fee amount is more typical in the sciences; therefore, this chart needs to be put into perspective. Half of the journal article publications in these universities came from the life sciences and medicine. Those scientists (32.2%) are more willing and more accustomed to paying \$1,000 or more from their grant funds than researchers in other disciplines, yet only 19.4% of physical scientists, 12.6% of engineers/computer scientists, 9.9% of social scientists, 9.7% of mathematicians, and 4.6% of arts/humanities are willing to pay \$1,000 or more

from grant funds. Our *College & Research Libraries* articles examines more closely the demographic differences in author willingness to pay APCs by funding choice (Tenopir, Dalton, Christian, Jones, McCabe, & Smith, 2016).

Demographic Differences

There are other demographic differences as well. Applied STEM fields such as engineering and medicine are more accepting of OA, but they also care more about impact factor. On a scale of 1 = disagree strongly and 5 = agree strongly, engineering/computer scientists ($M = 4.17$) and life sciences/medicine ($M = 4.15$) rate impact factor higher than the social sciences ($M = 4.08$), physical sciences ($M = 2.68$), humanities ($M = 3.95$), and mathematics ($M = 3.50$). Scholars in the humanities (their own ability to publish = 3.59; others' ability to publish = 4.25) and social sciences (their own ability to publish = 3.40; others' ability to publish = 4.17), on the whole, worry more that gold OA fees will hinder their ability as well as others' abilities to publish. The level of agreement from respondents in the mathematics, physical sciences, engineering/computer sciences, and life sciences/medicine ranged between $M = 2.99$ to 3.12 for their own publishing opportunities and $M = 2.97$ to 3.17 for potentially limiting others' publishing abilities.

Graduate students ($M = 2.99$) and post-doctoral researchers ($M = 3.29$) are slightly more likely to agree or strongly agree than faculty ($M = 2.80$) with the statement that APCs are a reasonable alternative

to subscription fees. On the other hand, compared to graduate students and post-doctoral researchers, faculty are less likely to think that OA will increase readership or the quality of research. They are also more likely to equate OA with lower quality research.

The quality and reputation of a journal is still what matters the most to academic authors and quality is most often defined by traditional measures. These qualitative results together with the wide range of quantitative data collected helped the teams shape potential solutions.

Article Publishing Costs

In our cost-per-article analysis, we attempted to ascertain what a sustainable journal publishing operation might cost on a per-article basis. We first explored the possibility of constructing a ground-up cost model. This was ultimately dismissed as unfeasible for a variety of reasons, notably the high degree of variability in what constitutes publishing services. In its place, we examined actual cost data from a variety of sources, including tax forms, literature reviews, analysis of gold OA journals in which our authors publish, and discussions with publishers. This process allowed us to develop a floor and average cost per article, including a 13% surplus to fund ongoing innovation. This sustainability range, from \$1,103 at the low end to \$2,566 at the high end, helped to establish the viability of the financial model we developed and test whether it could provide sufficient income for publishers to sustain their core functions.

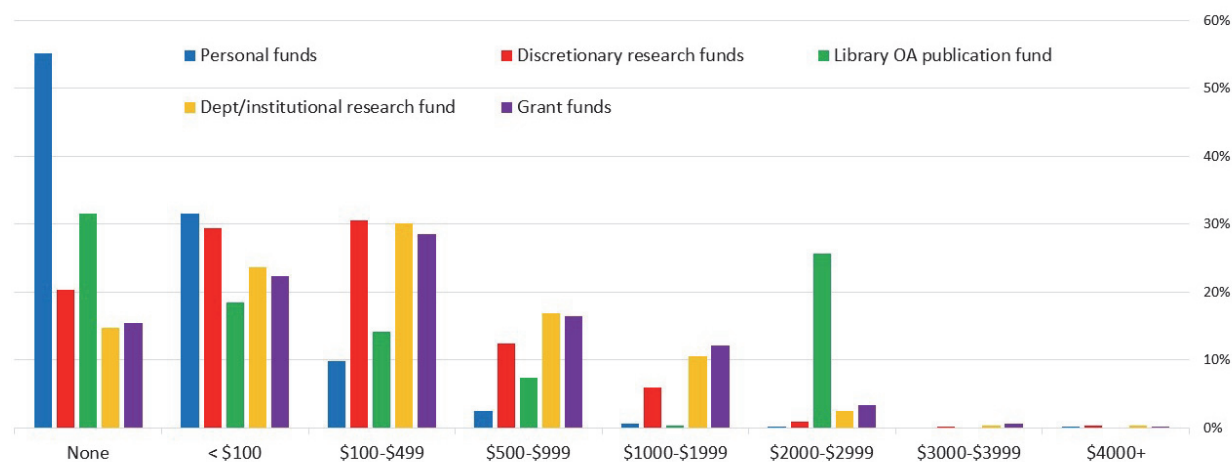


Figure 1. Willingness to pay APCs by funding source.

Complementing our cost-per-article analysis, various types of APC data were gathered for a thorough analysis of publisher and author behavior in setting and paying APCs. List price APC data for full OA journals were gathered from a longitudinal study led by Heather Morrison and were updated by our own investigations. We mapped the pricing dataset to our publication output data set to estimate how much researchers at our partner institutions paid in APC charges for publications in existing full OA journals over the course of the study (~\$1,892), as well as the average APC set by publishers for journals in which authors at our partner institutions published (~\$1,864). Additional data gathered from various European databases recording actual APC payments made by granting agencies or institutions on behalf of authors corresponded well to the average APCs determined in our partner mapping exercise (average \$1,865 for publication in a full OA journal).

Modeling Future APCs

Analyzing current APCs was instructive about the APC market as it exists today but was not sufficient to help us understand how APCs might evolve in the future if such practices were to become the norm. Given the findings from our author research about the importance of journal quality (as perceived by the author) in publication decisions, we approached this question through an economic analysis of the relationship between price and journal quality, using the journal source normalized impact per paper (SNIP) values as a proxy for journal quality. Our hypothesis was that in a true APC market, competition for authors will lead publishers to price their APCs based on a journal's perceived value to authors, which in turn will turn on perceptions of quality. A linear regression performed on a subset of APC pricing data, narrowed to journals from publishers that employed differential APCs for their journals, revealed a correlation coefficient of 0.654 based on SNIP quality values. The equation generated by this regression allowed us to predict the APC of any journal, given that journal's SNIP value. The APC for a baseline journal in this analysis (SNIP = 1.0) turned out to be \$1,857, in line with the average APCs uncovered elsewhere in our study. We then used this equation to predict the APC for every article in our bibliometric data set, thereby calculating the total cost of each institution's scholarly publishing activities for each year in our study.

Affordability of an APC Model

Our project defined affordability in terms of the relationship to current licensing costs: Would an APC-driven model be more or less expensive than a library's current journal subscriptions? We examined this question by calculating an APC "break-even" point for our library partners—what level of APC could each partner afford given its publishing output—and comparing that with the averages identified in our study. As one would expect, affordability turned on the research productivity of each partner. Smaller, less research-intensive institutions with lower publication output would be likely to realize substantial savings under an APC model, whereas the larger institutions would be likely to see their costs increase. For all our partners, given their research characteristics, an APC model would exceed the capacity of their current library budgets, significantly in some cases.

However, the availability of grant funding changes this picture dramatically. Grant-funded research was another parameter analyzed in our study. By identifying all articles that included a grant acknowledgement statement, an attribute that is tracked in the Web of Science bibliometric dataset, we were able to estimate the number of articles for which sponsored research funding might be available to cover an APC. In fact, we know that most articles being funded via APCs at our institutions today are paid for in this manner. A large percentage of our partner institutions' sponsored research funding (~72%) comes from federal agencies whose policies treat publication costs as an allowable expense, and many private funders have adopted such policies as well. When articles acknowledging a grant were eliminated from the total, subventing APCs for the remaining articles proved to be within the current library budget for even our most research-intensive partners.

Can APCs Be Made Sustainable?

Even if APCs are envisioned to be affordable under certain conditions today, a key concern in modeling a potential APC future is how to control costs and make them sustainable over time. Libraries' experience with runaway journals inflation is a cautionary lesson that would be important to guard against in designing a financial model for APCs. We developed a set of five criteria for a financial model

based on economic theory and the conclusions drawn from our author focus groups and survey: Libraries should continue to play a major funding role in any scenario; grant funding should be considered a legitimate and routine source of funding for open access publication charges; establishing the right marketplace incentives should be a key component of any funding model; to achieve a functional incentive structure, authors should have “some skin in the game”; and authors should not bear an undue burden in an APC-driven model. A fundamental premise is that a properly functioning journals marketplace requires author participation, rather than the purely intermediary relationship that obtains between libraries and publishers today.

Multipayer Approach

The result of our modeling was a multipayer strategy in which libraries and their parent institutions, authors, and funding agencies all play a role. Libraries would establish a baseline of APC support to ensure that authors are not overly burdened, monitoring the marketplace to determine appropriate levels of funding. Authors would be required to “top up” this subsidy when necessary, utilizing either grant funding or other institutional funds that would be made available to them for publication support (and potentially other purposes). Authors would be naturally incentivized to economize in their use of

these funds to stretch their research dollars, thereby exerting pressure on publisher pricing that would restrain or even lower APCs over time. Our modeling of this scenario suggests that distributing costs in this way would indeed be cost-effective for the large research institutions in our study.

Conclusions

As open access business models continue to evolve, libraries must plan for the significant impact of these changes on their budgets and professional practices, and they must seek to shape the new world that is emerging. While we do not yet know how fully open access publishing will take hold or what business models will prevail, the APC model has emerged as a leading contender for much of the Western canon and warrants our close scrutiny. In North America, library journal budgets alone will not fully cover APCs for research-intensive institutions in a flipped gold open access world. However, grant funding received by authors at those institutions would cover this difference in the vast majority of cases. In addition, our research suggests that involving authors in payment decisions by making discretionary publication funds available to them would introduce APC price competition, without interfering with author choice in where to publish. This would encourage a competitive journal market and drive costs down over time.

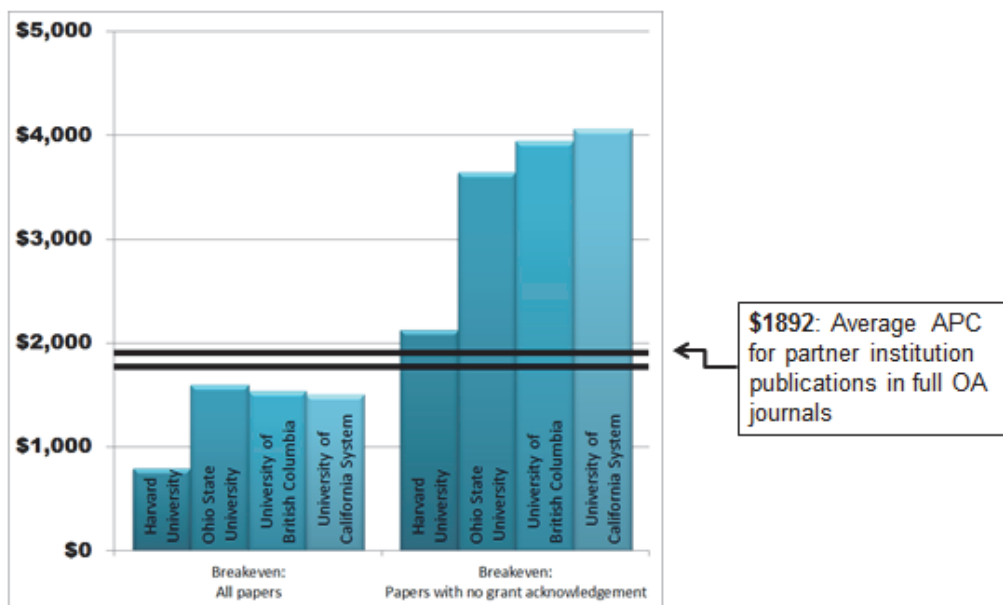


Figure 2. List price APC data for full OA journals.

These conclusions and the modeling done in our Pay It Forward project, while both rigorous and intriguing, remain a set of hypotheses to be tested in the cauldron of experience. We are continuing to

explore these issues and plan to seek out opportunities to test our ideas as the scholarly communications environment continues to unfold.

References

- Björk, B. C., Welling, P., Laakso, M., Majlender, P., Hedlund, T., & Guðnason, G. (2010). Open access to the scientific journal literature: Situation 2009. *PLoS ONE*, 5(6), 1–9. <https://doi.org/10.1371/journal.pone.0011273>
- Laakso, M., & Björk, B. C. (2012). Anatomy of open access publishing: A study of longitudinal development and internal structure. *BMC Medicine*, 10(1), 124. <https://doi.org/10.1186/1741-7015-10-124>
- Laakso, M., Welling, P., Bukvova, H., Nyman, L., Björk, B. C., & Hedlund, T. (2011). The development of open access journal publishing from 1993 to 2009. *PLoS ONE*, 6(6), 1–10. <https://doi.org/10.1371/journal.pone.0020961>
- Mellon Foundation (2016). *Pay It Forward: Investigating a sustainable model of open access article processing charges for large North American research institutions*. University of California Libraries. Retrieved from http://icis.ucdavis.edu/wp-content/uploads/2016/07/UC-Pay-It-Forward-Final-Report.rev_.7.18.16.pdf
- Morrison, H., Salhab, J., Calvé-Genest, A., & Horava, T. (2015). Open access article processing charges: DOAJ survey May 2014. *Publications* 3(1), 1–16. <https://doi.org/10.3390/publications3010001>
- Tenopir, C., Dalton, E. D., Christian, L., Jones, M. K., McCabe, M., Smith, M., & Fish, A. (in press). Imagining a gold open access future: Attitudes, behaviors, and funding scenarios among authors of academic scholarship. *College & Research Libraries*.
- Tenopir, C., Dalton, E., Fish, A., Christian, L., Jones, M., & Smith, M. (2016). What motivates authors of scholarly articles? The importance of journal attributes and potential audience on publication choice. *Publications*, 4(3), 22. <https://doi.org/10.3390/publications4030022>