

# Article processing charges: A new route to open access?

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**Abstract.** Article Processing Charges (APCs) have recently been studied as a means towards a sustainable Open Access (OA) environment for scholarly communications. However, APCs at any level represent a substantial economic barrier to the authors, institutions, funding agencies and governments that many of its advocates most wish to serve through OA initiatives. This paper claims that no business model based on APCs as a tool to facilitate the large-scale transition to OA can navigate the ethical dilemmas identified by political philosophers as appropriate for the kind of global environment in which scholarly publishing operates.

Keywords: Article processing charges, open access, social justice

## 1. Introduction

In this paper I will argue that important issues of social justice are not addressed by Open Access (OA) business models for scholarly communications based on Article Processing Charges (APCs).

In the wake of the Finch Report (2012),<sup>1</sup> and its subsequent implementation in the United Kingdom, there have been several English-language studies of APCs, especially in relation to their economic impact in Europe.<sup>2</sup> Two notable, data-rich research projects have recently been undertaken which seek to analyze the financial viability of providing open access more globally to academic journal literature.<sup>3</sup> These reports are very different in scope and style but they are discussed together here because they have one idea in common: to explore the economics of replacing with APCs many or all of the subscription fees currently paid by academic libraries. Its proponents claim that this idea, if implemented, would transform the business model for scholarly communications and allow worldwide Open Access (OA) to academic journal literature.

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<sup>1</sup>Finch, Dame J. (2012). Accessibility, sustainability, excellence: how to expand access to published research findings: Report of the Working Group on Expanding Access to Published Research Findings. Available at: <http://www.researchinfonet.org/wp-content/uploads/2012/06/Finch-Group-report-FINAL-VERSION.pdf> (Accessed: March 12, 2016).

<sup>2</sup>See Guy, M. and Holl, A. (2015). 'Pasteur 4OA Briefing Paper: Article Processing Charges.' doi:10.5281/zenodo.44318. See also Shamash, K. (2016). 'Article Processing Charges (APCs) and Subscriptions: Monitoring Open Access costs.' Available at: <https://www.jisc.ac.uk/reports/apcs-and-subscriptions> (Accessed September 19, 2016).

<sup>3</sup>Schimmer, R., Geschuhn, K.K. and Vogler, A. (2015). Disrupting the subscription journals' business model for the necessary large-scale transformation to open access. doi:10.17617/1.3; and University of California Libraries (2014). Pay It Forward: Investigating a Sustainable Model of Open Access Article Processing Charges for Large North American Research Institutions. Available at: <http://icis.ucdavis.edu/wp-content/uploads/2014/06/UC-Pay-It-Forward-narrative-2014-FINAL.pdf> (Accessed: March 12, 2016).

I take for granted that an OA environment for academic publishing would be desirable and in this paper I neither adjudicate between the two reports nor offer an alternative route. However, I argue that for OA advocates like me economic sustainability is a means to an end, not an end in itself. The end we seek is social justice. Social justice will certainly not be helped, and will quite possibly be hindered, by the kind of global ‘flip’ from subscription fees to APCs envisioned by both reports.<sup>4</sup>

Specifically, I claim that no business model based on APCs as a tool to facilitate the large-scale transition to OA can navigate the ethical dilemmas identified by political philosophers as appropriate for the kind of global environment in which scholarly publishing operates. I use Prof. Clayton M. Christensen’s theoretical framework to define APCs as a ‘sustaining innovation’ rather than the ‘disruptive innovation’ that is needed to reach a more ethically appropriate model; and I conclude by querying the continued dominance of the academic journal as a mode of research dissemination.<sup>5</sup>

## 2. What are APCs?

Article Processing Charges (APCs) may be defined as the charges levied by publishers from authors for publishing journal articles. The levy is generally set by commercial publishers at between a few hundred and a few thousand euros or US dollars per article.<sup>6</sup> BioMed Central (BMC) appears to have been the first academic publisher to introduce APCs when it was launched in 2000. The Public Library of Science (PLoS) began publishing journals that relied on APCs in 2003.<sup>7</sup> A good summary of their function is to be found on the PLoS publications web site:

“To provide Open Access, PLoS uses a business model that includes Article Processing Charges (APCs) to offset expenses – including those of peer review management, journal production and on-line hosting and archiving. Authors, institutions or funders are charged this publication fee for each article published.”<sup>8</sup>

By 2012, when David Solomon and Bo-Christer Björk published a landmark study of the OA journals which were using APCs, this method of funding academic publishing was already a generally accepted practice.<sup>9</sup> As a means to offset publication expenses, it is therefore no longer a particularly new feature

<sup>4</sup>For an interesting analysis of the ‘flip’ concept in its broader educational environment, see Weller, M. (2016). ‘The Open Flip – A Digital Economic Model for Education’, *JL4D: Journal of Learning for Development*, 3:2(2016). Available at: <http://www.jl4d.org/index.php/ej14d/index> (Accessed: September 19, 2016).

<sup>5</sup>For the text of the original conference presentation see Beasley (2016). ‘Article Processing Charges: A New Route to Open Access?’ Available at: <http://ebooks.iospress.nl/publication/42906> (Accessed: September 19, 2016). I am especially grateful to Profs. Leslie Chan, Jean-Claude Guédon, and Reggie Raju for subsequent comments and suggestions.

<sup>6</sup>For example, the web site of the largest scholarly publisher, Elsevier, states that ‘We can provide gold open access services because the article publishing charge (APC) that authors, their institutions or funding bodies pay, covers all expenses needed to support the publication process. Our APCs range from \$500-\$5000 USD.’ Available at: <https://www.elsevier.com/about/open-science/open-access> (Accessed: September 22, 2016).

<sup>7</sup>I am grateful to Prof. Jean-Claude Guédon for this historical background.

<sup>8</sup><https://www.plos.org/publications/> (Accessed: March 12, 2016).

<sup>9</sup>‘The number of such publishers, journals they publish, as well as of the number of articles published in these journals has been growing rapidly. In the last few years a number of leading traditional publishing companies have also started launching OA journals funded by APCs.’ See Solomon, D. and Björk, B.-C. (2012). ‘A Study of Open Access Journals Using Article Processing Charges.’ Accepted version of an article published in *The Journal of the American Society for Information Science and Technology* available at: <http://www.openaccesspublishing.org/apc2/> (Accessed: September 19, 2016). The subsequent growth of APCs in both open access and hybrid scholarly journals makes this analysis out of date but the article is frequently cited as a source for careful data analyses by subsequent authors. For more recent data see especially Morrison, H., Salhab, J., Mondésir, G., Calvé-Genest, A., Villamizar, C., Desautels, L. (2015). ‘Open access article processing charges longitudinal study 2015 preliminary dataset’, *Sustaining the Knowledge Commons [Distributor] V3 [Version]* <http://hdl.handle.net/10864/11269/>

in our rapidly evolving scholarly communications landscape. There are different types, and plenty of alternatives exist within the so-called ‘gold’ route to open access.<sup>10</sup> There are many debates among stakeholders concerning whether or not commercial publishers set APCs too high, but these debates need not concern us here. Furthermore, APCs have been adopted by several funding agencies as eligible expenses in policies seeking to promote open access to publicly funded research outputs.<sup>11</sup> APCs are accurately described in a recent report as now “the most widely used commercial method for financing Open Access publishing.”<sup>12</sup>

One reason for their prevalence is the well-documented fact that recently subscription fees paid by libraries for academic journals have been increasing beyond the rate of inflation in North America and elsewhere.<sup>13</sup> APCs are generally paid to publishers by the author(s), their parent institutions or granting agencies, with the expectation that subscription fees are either eliminated or at least substantially reduced as a result.

### 3. Two research projects

The results of the first research project I wish to introduce were issued by the Max Planck Digital Library (MPDL) in an Open Access White Paper published on April 28, 2015.<sup>14</sup> It provides data to support the authors’ conclusion that:

“... a large-scale transformation of the underlying business model of scientific journals is possible at no financial risk. Our own data analysis shows that there is enough money already circulating in the global market – money that is currently spent on scientific journals in the subscription system and that could be redirected and re-invested into open access business models to pay for APCs.”<sup>15</sup>

This White Paper forms the intellectual basis for a web site hosted by the MPDL that calls for signatories to a new initiative, *OA2020: initiative for the large-scale transition to open access*.<sup>16</sup> The web site is designed to record individual and institutional support for inducing “the swift, smooth and scholarly-oriented transformation of today’s scholarly journals from subscription to open access publishing.” It seeks the support of signatories in a similar way to the Max-Planck-Gesellschaft’s much older *Berlin Declaration on Open Access to Knowledge in the Sciences and Humanities* (2003).<sup>17</sup>

Meanwhile the University of California, under the leadership of UC Davis and the California Digital Library and with support from the Andrew W. Mellon Foundation, recently completed the second project

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(Accessed: September 19, 2016).

<sup>10</sup>In the ‘gold’ route to open access, publishers provide authors with the option to make published articles freely available online. It is usually contrasted with the ‘green’ route in which institutions offer authors additional or alternative open access venues such as institutional or discipline repositories.

<sup>11</sup>See for example Canada’s 2015 Tri-Agency Open Access Policy on Publications which includes as an eligible expense “Page charges for articles published, including costs associated with ensuring open access to the findings (e.g., costs of publishing in an open access journal or making a journal article open access).” Available at: <http://www.science.gc.ca/default.asp?lang=En&n=F6765465-1> (Accessed: March 12, 2016).

<sup>12</sup>Guy, M. and Holl, A. (2015). ‘Pasteur 4OA Briefing Paper: Article Processing Charges,’ p. 1. doi:10.5281/zenodo.44318.

<sup>13</sup>See for example Whitehead, M. and Owen, B. (2016). Canadian Universities and Sustainable Publishing (CUSP): A White Paper prepared on behalf of the Canadian Association of Research Libraries. Available at: [http://www.carl-abrc.ca/uploads/pdfs/Can\\_Univ\\_Sustainable\\_Publishing\\_2016.pdf](http://www.carl-abrc.ca/uploads/pdfs/Can_Univ_Sustainable_Publishing_2016.pdf) (Accessed: March 12, 2016).

<sup>14</sup>Schimmer, R., Geschuhn, K.K. and Vogler, A. (2015). Disrupting the subscription journals’ business model for the necessary large-scale transformation to open access. doi:10.17617/1.3.

<sup>15</sup>Ibid, 4.

<sup>16</sup><http://oa2020.org/> (Accessed: September 19, 2016).

<sup>17</sup><https://openaccess.mpg.de/Berlin-Declaration> (Accessed: September 19, 2016).

I wish to mention, called “Pay It Forward: Investigating a Sustainable Model of Open Access Article Processing Charges for Large North American Research Institutions.”<sup>18</sup> The project included partnerships with three major research libraries (Harvard University, Ohio State University and the University of British Columbia) as well as all 10 University of California campus libraries. The rationale for this project was articulated in the 2014 grant submission, available online:

“The key question that the proposed project asks is whether a large-scale conversion to open access scholarly journal publishing funded via APCs would be viable and financially sustainable for large North American research-intensive institutions, whose faculty currently author a significant percentage of the world’s research.”<sup>19</sup>

The project’s Final Report deserves a close reading. Its Executive Summary lists three major conclusions:

1. For the most research-intensive North American research institutions, the total cost to publish in a fully article processing charge-funded journal market will exceed current library journal budgets;

2. This cost difference could be covered by grant funds, already a major source of funding for publishing fees; but

3. Ultimately, author-controlled discretionary funds that incentivize authors to act as informed consumers of publishing services are necessary to introduce both real competition and pricing pressures into the journal publishing system. Discretionary funds for authors exist today, in the form of research grants, personal research accounts, endowed chair funds, and departmental funds, but the consistent application of these funds for this purpose would, in some cases, require new funding from the institution.<sup>20</sup>

As noted above, the scope of these two major contributions to the scholarly communications debate is by no means identical. The quality and value of the data on which their findings are based need not be doubted, though their conclusions are different. The MPDL study concludes that large research libraries would realize a substantial economic gain on behalf of their parent institutions if APCs replaced subscription costs as the principal underlying business model for scientific journals, whereas the final report of the University of California project records a number of critically important caveats, at least for large North American research-intensive universities. Despite these notable differences, however, the two projects are at least united in their focus on exploring APCs as a means towards an economically sustainable Open Access environment for scholarly communications.<sup>21</sup>

#### 4. Open access and social justice

I believe the two studies cited above present longstanding advocates for OA with a new challenge. It seems to me that a business model for scholarly communications largely or entirely based on APCs,

<sup>18</sup>University of California Libraries (2014). Pay It Forward: Investigating a Sustainable Model of Open Access Article Processing Charges for Large North American Research Institutions. Available at: <http://icis.ucdavis.edu/wp-content/uploads/2014/06/UC-Pay-It-Forward-narrative-2014-FINAL.pdf> (Accessed: March 12, 2016).

<sup>19</sup>See 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. June 30, 2016, Revised July 18, 2016. Available at: <http://icis.ucdavis.edu/wp-content/uploads/2016/07/UC-Pay-It-Forward-Final-Report.rev.7.18.16.pdf> (Accessed: September 19, 2016).

<sup>20</sup>University of California Libraries (2014). Op. cit. *Executive Summary*.

<sup>21</sup>Both projects have already received considerable attention, including discussions at the 2016 spring and fall general meetings of the Association of Research Libraries. See also the Aug. 24, Aug. 30 and Oct. 3, 2016 blogs of the Society for Scholarly Publishing: <https://scholarlykitchen.sspnet.org/tag/open-access/> (Accessed: October 28, 2016); and Virginia Steel, UCLA University Librarian, “An Open Letter to the Academic Community” (October 19, 2016).

whether or not it is financially advantageous for research-intensive institutions, needs to be questioned. Does it not represent a substantial economic barrier to the authors, institutions, funding agencies and governments we would most wish to serve through OA initiatives?

Such a question leads in many directions, one of which involves a reconsideration of the initial motivations behind the open access movement. Not surprisingly, the Wikipedia entry for Open Access (OA) offers one excellent summary of the initial motivation for OA advocates. It notes the technological and economic rationale for OA before stating that

“The OA movement is motivated by the problems of social inequality caused by restricting access to academic research, which favor large and wealthy institutions with the financial means to purchase access to many journals, as well as the economic challenges and perceived unsustainability of academic publishing.”<sup>22</sup>

Wikipedia’s construction of the problem – as one of “restricting access to academic research” – is entirely valid, but excludes the other major cause of social inequality, which relates more to the production of research than to its dissemination. A system based on author payments continues to favor those authors affiliated with organizations that have the means to pay. Both philosophically and literally, no matter how low the charge, there will be authors, institutions, funding agencies and governments unable to afford the cost of APCs.

This is not an original insight: in a seminal article by Peterson, Emmett and Greenberg in the *Journal of Librarianship and Scholarly Communication*, the authors note that:

“Lurking behind the joy of “the reader gets free access” are subtle assumptions and ethical dilemmas that arise on the author side of the equation. Averting new inequities as the OA movement gathers momentum is critical.”<sup>23</sup>

These inequities will be seen and experienced differently by different groups. Red flags have already been raised in relation to scholars working in Humanities disciplines by one of the initial Co-Directors of the Open Library of Humanities.<sup>24</sup> But in truth the problem is even larger: political philosophers may legitimately argue that OA models proposing APCs form part of an unintended neoimperialism in which first world publicly and privately funded research smothers the work of academic researchers in less developed nations as well as the *bona fide* research of other excluded or underprivileged communities, at home and abroad.<sup>25</sup> Such an outcome would perpetuate and even reinforce an already well-documented system of discrimination by which important groups are denied the privilege of seeing their research disseminated through generally accepted vehicles of scholarly communication.

Another source for understanding the initial motivations behind the OA movement is found in the texts produced by early advocates. In particular, the Budapest Open Access Initiative (BOAI), which preceded the Berlin Declaration and which first provided a public definition of open access, was the result of an international conference convened in December 2001.<sup>26</sup> The conference was supported by the

<sup>22</sup>[https://en.wikipedia.org/wiki/Open\\_access#CITEREFSuber2012](https://en.wikipedia.org/wiki/Open_access#CITEREFSuber2012) (Accessed: March 12, 2016).

<sup>23</sup>Peterson, A.T., Emmett, A. and Greenberg, M.L. (2013). ‘Open Access and the Author-Pays Problem: Assuring Access for Readers and Authors in a Global Community of Scholars’, *Journal of Librarianship and Scholarly Communication*, 1(3):eP1064. <http://dx.doi.org/10.7710/2162-3309.1064>.

<sup>24</sup>Eve, M. (2014). ‘All that Glisters: Investigating Collective Funding Mechanisms for Gold Open Access in Humanities Disciplines’, *Journal of Librarianship and Scholarly Communication* 2(3):eP1131. <http://dx.doi.org/10.7710/2162-3309.1131>.

<sup>25</sup>The word neoimperialism is perhaps too broad, but narrower terms seem unsatisfactory. Phrases such as ‘cultural imperialism’ or ‘electronic colonialism’ are associated too closely with media studies and development communication: see McPhail, T. (1981). *Electronic Colonialism: the Future of International Broadcasting and Communication*. Newbury Park: Sage; and McPhail, T. (2009), ed. *Development Communication: Reframing the Role of the Media*. Malden, MA: Wiley-Blackwell. I have also heard the phrase ‘knowledge imperialism’ but cannot locate a definition.

<sup>26</sup><http://www.budapestopenaccessinitiative.org/read> (Accessed: March 12, 2016).

Open Society Institute, founded by philanthropist George Soros and named after Karl Popper's famous foray into political philosophy, *The Open Society and its Enemies*.<sup>27</sup> The BOAI declaration issued on February 14, 2002 has proved to be an invaluable spur to action on the part of institutions and individual researchers worldwide. A decade later many of the original signatories were able to gather again in Budapest and reaffirm their goals – among which were “to achieve this unprecedented public good” and “to accelerate research, enrich education, share the learning of the rich with the poor and the poor with the rich, make this literature as useful as it can be, and lay the foundation for uniting humanity in a common intellectual conversation and quest for knowledge.”

There is considerable evidence that OA has indeed enabled many rich institutions and their researchers to share their learning with the poor – or at least, with those poor who benefit from direct or indirect access to an internet connection.<sup>28</sup> It is not so clear that OA has demonstrated its capacity to share the learning of the poor with the rich. However, at least we are using here the language of political philosophy, not of economics. We can therefore be confident the issue is presented in the right terms.

It is inspirational even today to read the BOAI's commitment to OA as a public good. It seems to me that this commitment can and should be seen in the context of theories of social justice. I believe there is much to be gained – or perhaps simply recovered – by judging, or reaffirming a resolution to judge the success of open access initiatives according to standards of social justice.<sup>29</sup>

## 5. APCs and innovation

APCs do address many of the financial concerns that have been used by OA advocates ever since the movement was founded. Sadly, however, it seems to me that they do not solve the more knotty problems raised by the concept of social justice.

Thanks to the internet, there is no longer any technological justification for this. I have heard the financial argument that if APCs were adopted in place of subscription costs then research institutions

<sup>27</sup>Popper, K. (1945, 2013). *The Open Society and its Enemies*. Princeton, NJ: Princeton UP.

<sup>28</sup>A recent OECD survey of authors with 2011 publications in science domains listed in Scopus, a major global scientific publication index, found that approximately 50–55% of the documents were openly available 3–4 years after publication. See Boselli, B. and Galindo-Rueda, F. (2016). “Drivers and Implications of Scientific Open Access Publishing: findings from a pilot OECD international survey of scientific authors”, OECD Science, Technology and Industry Policy Papers, No. 33, OECD Publishing, Paris. [http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DSTI/EAS/STP/NESTI\(2015\)4/FINAL&docLanguage=En](http://www.oecd.org/officialdocuments/publicdisplaydocumentpdf/?cote=DSTI/EAS/STP/NESTI(2015)4/FINAL&docLanguage=En) (Accessed: October 29, 2016).

<sup>29</sup>If this belief is accepted, then an important debate will still remain about which standards of social justice should apply to which open access initiatives. My opinions will likely be less important than the opinions of others. However, I am personally not convinced we need to move far from the principles of justice first established by John Rawls in his classic work *A Theory of Justice* (Boston, Mass: Harvard, 1971, 1999). These include the principle of democratic equality which I find especially applicable in our case: ‘Assuming the framework of institutions required by equal liberty and fair equality of opportunity, the higher expectations of those better situated are just if and only if they work as part of a scheme which improves the expectations of the least advantaged members of society. The intuitive idea is that the social order is not to establish and secure the more attractive prospects of those better off unless doing so is to the advantage of those less fortunate.’ (p. 65) Members of research-intensive universities or other institutions with personal means or access to relatively large grants would surely be classed as ‘better situated’ than researchers with little or no access to the same. So if it is acceptable to regard researchers as members of a society, and if it can be agreed that APCs will limit the contributions of the least advantaged members of this society, by establishing a financial barrier between them and their research dissemination, then it follows that APCs are unacceptable according to these standards of social justice. This is true no matter how low they are set, since the society will certainly include researchers who have no funds at all to disseminate their research. Of course, the exclusion of researchers may also lead to the impoverishment of the whole discipline, and therefore of the research of the ‘better off’ researchers too. This seems to me an important limitation on the public good of an OA world based on APCs.

would save so much that they could collectively repurpose a portion of the savings to address any inequities in the new system. Unfortunately, in addition to being vulnerable to all kinds of ethical pitfalls, there is insufficient evidence of this rebalancing effort in the current subscription-based environment, where it would seem to be equally valid. Stronger arguments may be based on the very real danger that without APCs we are left with an untenable status quo. There is no easy answer to this, but one way to develop a response is by briefly considering a theoretical framework for understanding APCs in relation to disruption theory.

Disruptive innovation is a much-discussed business term coined by Harvard Business School Professor Clayton M. Christensen:

“Disruptive innovation . . . describes a process by which a product or service takes root initially in simple applications at the bottom of a market and then relentlessly moves up market, eventually displacing established competitors.”<sup>30</sup>

Since introducing the concept some 20 years ago, Prof. Christensen and his followers have had to spend more and more time distinguishing disruptive innovation from other forms of market change.<sup>31</sup> Although postsecondary education has frequently been a target of the theory, it has not to my knowledge been applied to OA. In my opinion, however, OA was originally developed as a proposal that would lead to exactly the kind of disruptive innovation described by Christensen’s theory, i.e., allowing new market entrants – specifically OA journal publishers – to displace their established, subscription-based rivals. An OA world based on APCs, by contrast, appears instead to meet Christensen’s definition of a sustaining innovation:

“Disruption theory differentiates disruptive innovations from what are called ‘sustaining innovations.’ The latter make good products better in the eyes of an incumbent’s existing customers: the fifth blade in a razor, the clearer TV picture, better mobile phone reception. These improvements can be incremental advances or major breakthroughs, but they all enable firms to sell more products to their most profitable customers.”<sup>32</sup>

Setting aside the many obvious differences between academic and commercial business, it does seem possible to assert that an open access world based on APCs would make the journal article look better in the eyes of existing customers by providing more value for money. However, like all sustaining innovations, it might also maintain a kind of exclusive status quo for both market incumbents and their customers.

## 6. Conclusion

If the widespread and largescale adoption of APCs does not provide an optimal route to an OA environment for scholarly communications, because it fails to address the issue of social inequality, then what is the better path?

This is a challenging question and I believe it can only be answered by first empowering the voices of those who are currently disenfranchised: the research-oriented authors, institutions, funding agencies and governments who already face economic barriers, whether to research access or dissemination, but

<sup>30</sup><http://www.claytonchristensen.com/key-concepts/> (Accessed: March 12, 2016).

<sup>31</sup>Christensen, C.M., Raynor, M. and McDonald, R. (2015) ‘Disruptive innovation? Twenty years after the introduction of the theory, we revisit what it does – and does not – explain’, *Harvard Business Review*, 93(12):44–54. The theory was fully expounded in Christensen, C.M. (1997). *The Innovator’s Dilemma: When New Technologies Cause Great Firms to Fail*. Boston, Mass.: Harvard U Business Press.

<sup>32</sup>*Ibid*, 47-8.

whom we would like to include in our more equitable – and therefore more productive – future. Given the heterogeneity of these disenfranchised groups it seems obvious there will be no single solution.<sup>33</sup>

It also seems obvious, at least to this author, that such a question cannot be answered without questioning the long term future of the academic journal. After all, 2015 was declared to be the 350th anniversary of its birth, marked by the publication of the first volumes of the *Philosophical Transactions* (London, 1665) and *Le Journal des sçavans* (Paris, 1665).<sup>34</sup> Such an anniversary surely provided an excellent opportunity to reflect on the value of perpetuating the dominance of the academic journal: a first world product intended for a first world audience. This opportunity seems to have been largely missed. Yet the question remains: designed to use a particular 17th century technology to solve a particular 17th century problem, does history in the modern period justify the academic journal's – and journal publisher's – continued hegemony in the world of scholarly communications?

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<sup>33</sup>One alternative is 'diamond open access'. See Raju, R. (2016). 'Not a knee-jerk reaction: openness – a UX imperative', Paper presented at IFLA WLIC 2016, Columbus, OH. Available at: <http://library.ifla.org/1355/> (Accessed: September 21, 2016).

<sup>34</sup>For an excellent overview of the growth and present state of the scholarly journal industry, see Larivière, V., Haustein, S. and Mongeon, P. (2015). 'The Oligopoly of Academic Publishers in the Digital Era.' PLoS ONE 10(6): e0127502. doi:[10.1371/journal.pone.0127502](https://doi.org/10.1371/journal.pone.0127502).