

Open Access Publishing Trends in the Forest Sciences

Kevin L. O'Hara 

Department of Environmental Science, Policy and Management, University of California, 130 Mulford Hall, MC 3114, Berkeley, CA 94720-3114, USA; kohara@berkeley.edu; Tel.: +1-510-642-2127

Received: 30 January 2019; Accepted: 6 March 2019; Published: 8 March 2019



Abstract: Open access models for academic publishing offer an alternative to traditional subscription-based journals. In the open access model, the author generally retains the copyright and the published articles are available free on the internet. Publication costs are either borne by the author as article processing charges, or are free for some journals published by societies or institutions. Traditional subscription-based journals are funded by subscription costs to libraries and individuals, the publisher retains the copyright, and these journals are generally not freely available to the public. This traditional model has created two problems: (1) many for-profit publishers control access in a form of oligopoly and impose high costs to subscribers; and (2) it limits access of scientific information to the public which disproportionately affects poorly funded research institutions and developing countries. Other subscription-based journals are published by scientific and professional societies but are not “for-profit”. In the forest sciences, several open access journals emerged in the last 10–15 years. These open access journals are published by for-profit publishing companies, research institutions, and professional societies. Some of these journals have been successful at attracting manuscript submissions, becoming indexed by various indexation services, and have seen metrics representing their importance increase over time. This paper documents these trends and assesses the viability of the open access model in the forest sciences and compares them to other types of journals.

Keywords: open access; scholarly publishing; publishing trends; Clarivate Analytics

1. Introduction

Academic publishing is going a period of rapid transition that is having profound effects on science delivery [1–6]. In recent decades, academic publishing has become an extremely lucrative business where large publishing firms have a captive audience for their products. The industry has become dominated by a handful of academic publishing companies that increasingly control a larger share of the market [7,8]. Under this “oligopoly”, subscription costs have risen dramatically and the scientific communities, including the libraries that serve these communities, are objecting [1,3,7]. A similar model is nonprofit and subscription based, but published by societies, research institutes, or university presses. These journals typically have lower subscription costs [9,10], but are a declining share of the academic publishing empire [8]. Both subscription-based models rely on authors writing and submitting manuscripts to journals, and for authors to edit and peer-review these manuscripts, generally on a volunteer basis. The publishers essentially have free raw material (the manuscript), free labor (the editing and review), but assume the cost of facilitating the review process and the publication expenses of layout and delivery [11]. Since research is largely publicly sponsored, a 2005 Deutsche Bank report described it as a “triple pay” where “the state funds most research, pays the salaries of most of those checking the quality of research, and then buys most of the published product” [3].

Perhaps equally as important is the criticism that the traditional scientific publishing model simply restricts access to science. Whereas institutional libraries have varying access to published

scientific articles behind a “paywall”, the public does not. Dissemination of scientific information is therefore constrained by the traditional model because not all libraries can subscribe to every journal, and non-scientists may have no free access at all. This is particularly detrimental to research and non-research communities in developing countries [12,13] and is a social justice issue [14].

In recent decades, and in response to shortcomings of the traditional model, the open access alternative began to emerge [15]. Under this model, authors typically pay article processing charges (APC) for accepted papers which are then published online free to anyone. Hence the open access model is possible because of the development of electronic dissemination and the internet. In contrast to the traditional model, the author usually retains the copyright in the open access model. In some cases, open access journals published by societies or institutions may have no article processing charges.

There are many instances where the lines between these two models become blurred. For example, many publishers under the traditional subscription-based model offer an open access option for a fee (APC). If authors choose this option, they pay this extra fee and the publication is available to everyone on the publisher’s website. This “hybrid open access” option has no benefit for subscribers who already have full access or to authors in organizations which have access through subscription; instead, authors are paying extra for the benefit of others: a form of double-payment [5,16]. Hence some funding organizations have indicated they will not support this option [17,18]. Another exception are traditional journals that may make content free and open access after a period of time (e.g., an “embargo”), such as a year or two [19]. A further split is between for-profit and nonprofit publishers. For-profit publishers are the commercial publishing firms that often publish large catalogs of journals. The non-profit publishers are societies, institutions, or university presses that publish scientific journals. Both for-profit and nonprofit publishers publish both traditional and open access journals. Typically, the for-profit publishers charge more for subscriptions than the nonprofit publishers [9].

At present, issues associated with for-profit publishers have reached a crisis [3]. Rising subscription rates and limited library budgets are forcing libraries to evaluate and cut subscriptions [20]. The issues with controlled access are also a driver. The US National Institute of Health’s 2008 mandate for open access required that work it funded be available to the public for free within 12 months of publication [21]. In 2018, “Plan S” was launched by the European Research Institute and research organizations from 12 European countries declaring that beginning in 2020, “scientific publications on the results from research funded by public grants provided by national and European research councils and funding bodies, must be published in compliant Open Access Journals or on compliant Open Access Platforms” [18].

Much of the focus on the big academic publishers is on Elsevier, or Reed-Elsevier, which publishes more than 2500 scientific journals [22] or 24% of all scientific journals [7]. Elsevier’s annual profits were reported at 36% in 2010 [3] and nearly 37% in 2017 [23]. Similar profits have been reported for Springer and Taylor & Francis [2,7]. Due to high subscription costs, German and Swedish universities have ended their contracts with Elsevier [24]. The University of California system recently ended its negotiations with Elsevier thereby terminating all Elsevier subscriptions [25,26]. An online petition called the “The Cost of Knowledge” has over 17,000 signatures of scientists who have pledged not to publish, review, or edit with Elsevier [27]. Some universities are urging researchers to publish in open access journals [20] and the University of California–Los Angeles recently urged researchers to boycott Elsevier completely [28]. SPARC provides detailed information on cancellations with large publishers and various university and institutes [29].

As the academic publishing industry changes, what are the effects on forest science? The forest sciences are a small segment of this industry but include all publication models, including the large for-profit publishers. This paper examines the status of open access publishing in the forest sciences to determine if trends follow the larger changes in the industry regarding: viability of the different academic publishing models, capacity for open access, and growth of the open access segment.

2. Materials and Methods

The data for this analysis were from “Journal Citation Reports” in Clarivate Analytics [30], formerly the Web of Science, for the subject category “forestry”. The most recent data available were from 2017. The entire “forestry” category was used to show long-term trends in published articles, but remaining analyses used only a subset of these data from journals in the forest sciences covering a broad range of topics. Four types of journals in forest science were included in this analysis: (1) for-profit, subscription-based, (2) nonprofit, subscription-based, (3) for-profit, open access, and (4) nonprofit open access (Table 1). Clarivate Analytics denotes journals that are open access; however, *Silva Fennica* was incorrectly labeled as non-open access by Clarivate Analytics and was corrected in this analysis. Within the “forestry” category, only journals that routinely publish over a range of forest science topics and were international in scope were included. Journals were excluded if they were specialized (e.g., *Tree Physiology*, *Forest Policy and Economics*, *New Forests*), or not published in English (e.g., *Austrian Journal of Forest Science*, *Bosque*). Journals were also excluded if their target audience was the management community rather than the scientific community (e.g., *Journal of Forestry*, *Forest Chronicle*). A subjective assessment using Clarivate Analytics data for origins of contributions was used to determine whether a journal was international in scope. Journals that primarily published articles from their region were not considered international in scope. Additionally, journal indexing data was required for three years (2015–2017) which excluded some indexed journals (e.g., *Journal of Sustainable Forestry*, *Forest Ecosystems*), and all non-indexed journals (e.g., *Journal of Biodiversity Management and Forestry*). Many journals have similar names (e.g., *Journal of Forest Research*, *Journal of Forestry Research*). To avoid confusion over journal identities, ISSN and country of origin are given in Table 1.

Table 1. Journals included in this analysis—in alphabetical order within category—including ISSN and country of publication.

Journal Name	Publisher	ISSN	Country of Publication
For-Profit, Subscription Journals			
<i>Annals of Forest Science</i>	Springer	1286-4560	France
<i>European J. Forest Research</i>	Springer	1612-4669	Germany
<i>Forest Ecology Management</i>	Elsevier	0378-1127	Netherlands
<i>J. Forest Research</i>	Taylor & Francis	1341-6979	Japan
<i>Scandinavian J. For. Research</i>	Taylor & Francis	0282-7581	Norway
Nonprofit, Subscription Journals			
<i>Canadian J. Forest Research</i>	NRC Res. Press	0045-5067	Canada
<i>Forest Science</i>	Oxford Univ. Press ¹	0015-749X	USA
<i>Forestry</i>	Oxford Univ. Press	0015-752X	UK
<i>International Forestry Review</i>	Commonwealth For. Association	1465-5489	UK
For-Profit, Open Access Journals			
<i>Forests</i>	MDPI ²	1999-4907	Switzerland
Nonprofit, Open Access Journals			
<i>Annals of Forest Research</i>	Forest Res. Management Inst.	1844-8135	Romania
<i>Forest Systems</i>	INIA ³	2171-5068	Spain
<i>iForest: Biogeoscience and For.</i>	SISEF ⁴	1971-7458	Italy
<i>New Zealand J. Forestry Science</i>	Scion ⁵	1179-5395	New Zealand
<i>Silva Fennica</i>	Finnish Soc. For. Sci.	0037-5330	Finland

¹ *Forest Science* was published by Society of American Foresters through 2017; ² Multidisciplinary Digital Publishing Institute; ³ Instituto Nacional de Investigacion y Tecnologia Agraria y Alimentaria; ⁴ Italian Society of Silviculture and Forest Ecology; ⁵ *New Zealand J. For. Sci.* moved from Springer to SCION, a national research institute, on 1 January 2019.

Impact factors allow comparisons of journal that are independent of the journal size or number of papers published. The impact factor is calculated the number of citations, received in that year, of articles published during the two preceding years, divided by the total number of articles published in that journal during the two preceding years [30]. Impact factors have become the most common means of ranking journals, although, not without problems [5,31,32]. In this analysis impact factors, and rankings of impact factors within the “forestry” category of Clarivate Analytics data were used to

compare journals. These rankings from three years (2015–2017) were used to show changes over time. The number of papers published (citable items) in 2017 was used to assess recent journal size. Earlier numbers of citable items were used to show publishing trends over time.

3. Results

The annual number of citable items in the “forestry” category in the Clarivate Analytics data has increased by a factor of 2.36 from 2003 to 2017 (Figure 1). These data include the entire “forestry” category including specialized journals and journals not published in English. This increase is consistent with other subject categories in the Clarivate Analytics data: for example, “agriculture–multidisciplinary” increased by a factor of 2.42, “biology” by 1.95, “ecology” by 1.95, and “management” by 3.50.

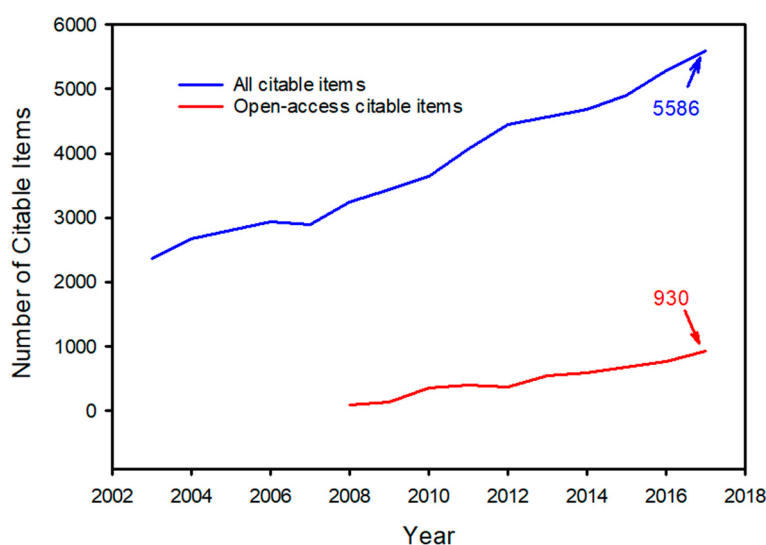


Figure 1. Cumulative total number of citable items (blue) and number of citable items from open access journals in the Clarivate Analytics data for “forestry”. Numbers show values in 2017. Open access citable items represent an increasing percent of total citable items in the forest sciences.

The share of total citable items in the “forestry” category from open access journals has increased over the period from 2013–2017 from approximately 12.0% to over 16.6% (Figure 1). These figures do not include open access papers in hybrid open access journals so likely underestimate total citable items that are open access. During this same five-year period, the total number of Journals in the “forestry” category has fluctuated from 64 to 66. The number of open access forestry journals has increased from 7 to 9 over this same period.

The impact factors for the general forest science journals analyzed in this study ranged across the entire forestry rankings regardless of which publication model they were under (Table 2). Over the three years of data (2015–2017), most rankings changed very little. Some exceptions were *Forestry* which moved upward, and *Forest Science*, *Journal of Forest Research*, and *Annals of Forest Science* which moved down. There appears to be greater volatility in rankings of the open access journals, particularly with *Forests* and *iForests: Biogeosciences and Forestry*. In terms of citable items, the two largest of these general forest science journals were *Forest Ecology and Management* (for profit, subscription) and *Forests* (for-profit, open access).

Table 2. Total citable items for all “forestry” data, and 2017 data for general forest science journals. Rankings for from 2015–2017 with total journals in parentheses.

Journal Name	2017 Citable Items	2017 Impact Factor	Rank		
			2015 (66)	2016 (64)	2017 (66)
For Profit, Subscription Journals					
Annals of Forest Science	78	2.357	9	10	14
European J. Forest Research	78	2.409	11	11	13
Forest Ecology Management	604	3.169	4	3	4
J. Forest Research	57	0.908	35	45	45
Scandinavian J. For. Research	81	1.600	31	19	29
Nonprofit, Subscription Journals					
Canadian J. Forest Research	174	1.887	17	16	20
Forest Science	64	1.364	16	17	34
Forestry	60	2.638	13	8	9
International Forestry Review	36	1.495	34	30	30
For Profit, Open Access Journals					
Forests	497	1.956	19	13	18
Nonprofit, Open Access Journals					
Annals of Forest Research	23	1.32	42	40	36
Forest Systems	46	0.96	40	38	44
iForest: Biogeoscience and For.	126	1.246	30	22	37
New Zealand J. Forestry Science	24	1.333	41	37	35
Silva Fennica	61	1.683	27	27	28

4. Discussion

The forest sciences, despite being a relatively small piece of the scientific publishing domain, are experiencing the same controversies affecting the rest of scientific publishing. Forest science journals are found in the four publishing models: (1) for-profit, subscription-based; (2) nonprofit, subscription based; (3) for-profit, open access, and nonprofit, open access. The publishers of these journals include three of the five large for-profit publishers [7], including Elsevier. The forest science journals also include an array of publishers including large nonprofit publishers (e.g., Oxford University Press (Oxford, UK)), and society/institutional publishers.

Open access publishers represent a small but growing segment in forest science publishing. The 16.6% reported here is consistent with the estimated 15% in all fields [23]. However, this is far below other estimates for all open access articles, including those from hybrid journals [33]. By all measures this percentage seems to be growing, including in the forest sciences. The growth in the open access sector is not without its problems. New journals often are under pressure to grow and increase their impact factor, including open access journals [34]. The low overhead needed to publish an online journal and the demand for more open access alternatives has led to many new open access journals in recent years. However, not all are legitimate [35] and authors should carefully consider new, unproven journals.

Applied sciences have readership from both the science community and the communities that apply this work. This is true in forestry and other natural resource fields where science builds on science, but also where natural resource managers use science to advance management practices. Often the people that apply science such as doctors, architects, engineers, dentists, forest managers, and other professionals do not have access to library collections of in-print or online journals, regardless of paywalls. Managers in the natural resources are often further constrained by working in remote locations. Hence the development of open access and electronic distribution of scientific information has been a potential benefit to the application of science because of easy access to large amounts of information.

A drawback to open access publishing in general is that many authors cannot afford article processing charges [36]. Indeed, the up-front article processing charges that provide free open access to everyone electronically may also be the obstacle that prevents many from publishing in open access

journals. The open access model may therefore increase the availability of science to developing countries but make it more difficult for scientists in these same regions to publish in open access journals. Hence, open access is not a perfect model for academic publishing and other models, including subscription-based models, can serve a critical role.

Whereas the article processing charges that are characteristic of open access publishing are common, there are no-cost open access alternatives including in the forest sciences. When journals are supported by professional or scientific societies, or government-funded research institutes, there may be no author processing charges. Four of the forest science open access journals have no article processing charges: *Annals of Forest Research*, *Forest Systems*, *iForest: Biogeosciences and Forestry*, and the *New Zealand Journal of Forestry Science*. Article processing charges for *Forests* are 1800 CHF (about 1600 €), and for *Silva Fennica* 800 €. Both of these journals have programs to lower or waive article processing fees for authors with limited resources.

Authors in the forest sciences are, of course, not limited to the “forestry” journals listed here. This analysis was limited to only the general journals listed in the Clarivate Analytics “forestry” category. These Clarivate Analytics data only include journals with minimal publishing history and the most recent data is from 2017. Other reputable journals do exist, so this analysis does not include all possible journals for publishing in the forest sciences.

5. Conclusions

As the academic publishing industry evolves in response to growth in scientific publishing and demands for greater access and lower costs, there will likely be profound changes. At present, this evolution appears to be happening very rapidly. Open access is becoming an increasingly important segment of the academic publishing industry, due in part to demands for greater access and lower costs.

The publishing situation with the forest sciences mirrors the larger publishing situation but at a much smaller scale. Open access in the forest sciences is increasingly available in a few open access and hybrid journals. The total number of citable items in the “forestry” category of the Clarivate Analytics data is growing due in part to expansion in other segments besides open access. The percentage of open access citable items is also increasing relative to the total in the forest sciences. Open access publishing appears to be a viable and growing model in the forest sciences.

Acknowledgments: This article was prepared for the special issue of *Forests* on “A decade of *Forests* Open Access Publishing”. Helpful advice and review comments were provided by Petru Tudor Stancioiu and Dorota Dobrowolska. This author’s work on this article was supported by the US Department of Agriculture, National Institute of Food and Agriculture.

Conflicts of Interest: The author is an Editorial Board member of *Forests*, and a signatory to the online *Cost of Knowledge* [27] petition.

References

1. Knezo, G.J. Open Access Publishing and Citation Archives: Background and Controversy. In *CRS Report for Congress, Order Code RL3323*; U.S. Congressional Research Service: Washington, DC, USA, 2006; p. 55.
2. Hu, J.C. Academics want you to read their work for free. *The Atlantic*. 26 January 2016. Available online: <https://www.theatlantic.com/science/archive/2016/01/elsevier-academic-publishing-petition/427059/> (accessed on 25 January 2019).
3. Buranyi, S. Is the staggeringly profitable business of scientific publishing bad for science? *The Guardian*. 27 June 2017. Available online: <https://www.theguardian.com/science/2017/jun/27/profitable-business-scientific-publishing-bad-for-science> (accessed on 21 January 2019).
4. De Silva, P.U.K.; Vance, C.K. *Scientific Scholarly Communication: The Changing Landscape*; Springer: Cham, Switzerland, 2017.
5. Anderson, R. *Scholarly Communication: What Everyone Needs to Know*; Oxford University Press: New York, NY, USA, 2018.

6. Smith, K.L.; Dickson, K.A. (Eds.) *Open Access and the Future of Scholarly Communication: Policy and Infrastructure*; Rowman & Littlefield: Lanham, MD, USA, 2016.
7. Lariviere, V.; Haustein, S.; Mongeon, P. The oligopoly of academic publishers in the digital era. *PLoS ONE* **2015**, *10*, e0127502. [CrossRef] [PubMed]
8. MacDonald, F. These five companies control more than half of academic publishing. *Science Alert*. 10 June 2015. Available online: <https://www.sciencealert.com/these-five-companies-control-more-than-half-of-academic-publishing> (accessed on 25 January 2019).
9. Bergstrom, T.C.; Courant, P.N.; McAfee, R.P.; Williams, M.A. Evaluating big deal journal bundles. *Proc. Natl. Acad. Sci. USA* **2014**, *111*, 9425–9430. [CrossRef] [PubMed]
10. Bergstrom, C.T.; Bergstrom, T.C. The economics of ecology journals. *Front. Ecol. Environ.* **2006**, *4*, 488–495. [CrossRef]
11. Bergstrom, T. Free labor for costly journals? *J. Econ. Perspect.* **2001**, *15*, 183–198. [CrossRef]
12. Arunachalam, S. Open access and the developing world. *Natl. Med. J. India* **2004**, *17*, 289–291. [PubMed]
13. Nicholson, D. Why open access to information is crucial to developing countries. *World Economic Forum*. 21 August 2015. Available online: <https://www.weforum.org/agenda/2015/08/why-open-access-to-information-is-crucial-for-developing-countries/> (accessed on 24 January 2019).
14. Arunachalam, S. Social justice in scholarly publishing: Open access Is the only way. *Am. J. Bioeth.* **2017**, *17*, 15–17. [CrossRef] [PubMed]
15. Laakso, M.; Welling, P.; Bukvova, H.; Nyman, L.; Bjork, B.; Hedlund, T. The development of open access journal publishing from 1993 to 2009. *PLoS ONE* **2011**, *6*, e20961. [CrossRef] [PubMed]
16. Hybrid Open Access—An Analysis. Available online: <https://unlockingresearch-blog.lib.cam.ac.uk/?p=969> (accessed on 25 January 2019).
17. Stokstad, E. In win for open access, two major funders won't cover publishing in hybrid journals. *Science*. 5 November 2018. Available online: <http://www.sciencemag.org/news/2018/11/win-open-access-two-major-funders-wont-cover-publishing-hybrid-journals> (accessed on 25 January 2019).
18. cOAlition S. Making Full and Immediate Open Access a Reality. Available online: <https://www.coalition-s.org/> (accessed on 25 January 2019).
19. Laakso, M.; Bjork, B. Delayed open access: An overlooked high-impact category of openly available scientific literature. *J. Am. Soc. Inf. Sci. Technol.* **2013**, *64*, 1323–1329. [CrossRef]
20. Sample, I. Harvard University says it can't afford journal publisher's prices. *The Guardian*. 24 April 2012. Available online: <https://www.theguardian.com/science/2012/apr/24/harvard-university-journal-publishers-prices> (accessed on 25 January 2019).
21. NIH Public Access Policy. Available online: <https://publicaccess.nih.gov/comments.htm> (accessed on 25 January 2019).
22. RELX Group: Annual Reports and Financial Statements-2017. Available online: <http://www.relx.com/~{}media/Files/R/RELX-Group/documents/reports/annual-reports/relx2017-annual-report.pdf> (accessed on 25 January 2019).
23. Hiltzik, M. In UC's battle with the world's largest scientific publisher, the future of information is at stake. *Los Angeles Times*. 7 December 2018. Available online: <https://www.latimes.com/business/hiltzik/la-fi-hiltzik-uc-elsevier-20181207-story.html> (accessed on 25 January 2019).
24. Kwon, D. Universities in Germany and Sweden lose access to Elsevier journals. *The Scientist*. 19 July 2018. Available online: <https://www.the-scientist.com/news-opinion/universities-in-germany-and-sweden-lose-access-to-elsevier-journals--64522> (accessed on 25 January 2019).
25. Hiltzik, M. UC terminates its subscriptions to 2500 journals in a battle over copyrights and access. *Los Angeles Times*. 1 March 2019. Available online: <https://www.latimes.com/business/hiltzik/la-fi-hiltzik-uc-elsevier-publishing-20190301-story.html> (accessed on 7 March 2019).
26. Zhang, S. The real cost of knowledge. *The Atlantic*. 4 March 2019. Available online: <https://www.theatlantic.com/science/archive/2019/03/uc-elsevier-publisher/583909/> (accessed on 7 March 2019).
27. The Cost of Knowledge. Available online: <http://thecostofknowledge.com/index.php> (accessed on 25 January 2019).
28. Ellis, L. In talks with Elsevier, UCLA reaches for a novel bargaining chip: Its faculty. *Chronicle of Higher Education*. 12 December 2018. Available online: <https://www.chronicle.com/article/In-Talks-With-Elsevier-UCLA/245311> (accessed on 25 January 2019).

29. SPARC: Big Deal Cancellation Tracking. Available online: <https://sparcopen.org/our-work/big-deal-cancellation-tracking/> (accessed on 25 January 2019).
30. Clarivate Analytics. Available online: <https://clarivate.com> (accessed on 25 January 2019).
31. Seglen, P.O. Why the impact factor of journals should not be used for evaluating research. *Br. Med. J.* **1997**, *314*, 498–502. [[CrossRef](#)]
32. Svensson, G. SSCI and its impact factors: A “prisoner’s dilemma”? *Eur. J. Mark.* **2010**, *44*, 23–33. [[CrossRef](#)]
33. Piwowar, H.; Priem, J.; Lariviere, V.; Alperin, J.P.; Matthias, L.; Norlander, B.; Farley, A.; West, J.; Haustein, S. The state of OA: A large-scale analysis of the prevalence and impact of Open Access articles. *PeerJ* **2018**, *6*, e4375. [[CrossRef](#)] [[PubMed](#)]
34. De Vrieze, J. Open-access journal editors resign after alledged pressure to publish mediocre papers. *Scientific Community*, 4 September 2018.
35. Beall, J. Predatory publishers are corrupting open access. *Nature* **2012**, *489*, 179. [[CrossRef](#)] [[PubMed](#)]
36. West, J.D.; Bergstrom, T.; Bergstrom, C.T. Cost effectiveness of open access publications. *Econ. Inq.* **2014**, *52*, 1315–1321. [[CrossRef](#)]



© 2019 by the author. Licensee MDPI, Basel, Switzerland. This article is an open access article distributed under the terms and conditions of the Creative Commons Attribution (CC BY) license (<http://creativecommons.org/licenses/by/4.0/>).