

# Will Sci-Hub Kill the Open Access Citation Advantage and (at least for now) Save Toll Access Journals?

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## Introduction

It is a generally accepted fact that open access journal articles enjoy a citation advantage.<sup>1</sup>

This citation advantage results from the fact that open access journal articles are available to everyone in the world with an Internet connection. Thus, anyone with an interest in the work can find it and use it easily with no out-of-pocket cost. This use leads to citations. Articles in toll access journals on the other hand, are locked behind paywalls and are only available to those associated with institutions who can afford the subscription costs, or who are willing and able to purchase individual articles for \$30 or more.

There has always been some slippage in the toll access journal system because of informal sharing of articles. Authors will usually send copies of their work to those who ask and sometime post them on their websites even when this is not allowable under publisher's agreements. Stevan Harnad and his colleagues proposed making this type of author sharing a standard semi-automated feature for closed articles in institutional repositories.<sup>2</sup> The hashtag #ICanHazPDF can be used to broadcast a request for an article that an individual does not have access to.<sup>3</sup> Increasingly, toll access articles are required by funder mandates to be made publically available, though usually after an embargo period. Sci-Hub though goes well beyond the ad hoc arrangements and even public access policies. It takes the free and easy provision of toll access journal content to a whole new level.

Sci-Hub was founded by Alexandra Elbakyan, at the time a 22-year old computer science graduate student from Kazakhstan. It launched on September 5, 2011. In October 2016 the site claimed to house over 58 million papers that were acquired by gaining access to toll access journals through donated credentials from sympathetic researchers, or, as Sci-Hub's detractors claim, by acquiring the credentials through phishing. In February 2016 the site claimed to have provided over 6.2 million papers or

over 200,000 per day. Between September 2015 and February 2016 requests to Sci-Hub came from 3 million unique IP addresses. While it might be expected that the use would be concentrated in the developing world where access to toll access journals is limited, this is not the case. Much of the use of Sci-Hub came from the United States and Europe. There has been speculation that the site's comprehensive collection and simple interface makes it a preferred option even for people with access to robust library collections. The site is funded by donations paid in bitcoin. Sci-Hub has been sued by Elsevier for copyright violations. Sci-Hub lost. But because Sci-Hub's servers are not located in the United States where the suit was filed, it has not been shut down, though it has been forced to change its domain.<sup>4 5</sup>

In a *Science* article on Alexandra Elbakyan, Sci-Hub was referred to as, "an awe-inspiring act of altruism or a massive criminal enterprise, depending on whom you ask."<sup>6</sup> It is of course both.

Among other things, Sci-Hub has demonstrated that the technology necessary to provide broad access to very large quantities of scholarly papers need not be a choke point in the scholarly communications system.

The illegality of Sci-Hub is clearly an issue, but at the end of the day what it has done is to make all of the world's scholarly research functionally open access.

### Questions Raised by Sci-Hub

Sci-Hub has changed the landscape of scholarly publishing and this raises several interesting questions.

*Question One: Will this the citation advantage enjoyed by authors of open access articles disappear when all articles, both open and toll access, are freely available to everyone in the world?*

Readers will need to know about Sci-Hub, but it is hardly a secret, and finding the site is not difficult, even as it has been forced by legal action to move.

I am prepared to argue that there could in fact be a Sci-Hub citation effect. The effect will be an increase in the use and citation of toll access journals because they are now, from the reader's perspective, for all practical purposes open access. It will likely be less significant in the United States and Europe, but should be observable in less developed parts of the world where access to toll access content was difficult or impossible before Sci-Hub. This should be easy to test by looking at articles with significant downloads from Sci-Hub that have a citation history and seeing if the citation patterns for these articles changes, and, if so, how.

On the other hand, to date the number of downloads from Sci-Hub, while substantial, might not be large enough to create a significant citation impact. If we extrapolate from

the figures cited above would be approximately 75 million papers downloaded from Sci-Hub in a year. This is a large number and clearly Elsevier was concerned enough to sue, but it is important to keep the number in context. The IUPUI University Library downloads about 1.5 million articles from the kinds of journals from the major scholarly publishers and several million more from the EBSCO and ProQuest aggregations. Thus, one could argue that the Sci-Hub effect today is that of about 25 or 30 mid-sized academic libraries. This should be enough to see some impact, but on a world-wide scale maybe not that much. It will be interesting to watch the growth of Sci-Hub downloads, if it gets to be more than several 100s of millions a year, real clear world-wide impact would be expected.

*Question Two: If the open access citation advantage disappears or is reduced because of Sci-Hub, will this provide an advantage to toll access journals as it will make their relative impact factors stronger and cause additional citation for individual articles?*

I am inclined to believe that the citation advantage that Sci-Hub provides to toll access journals is unlikely to modify author behavior significantly. It may make the case for open access a more difficult sell to established researchers who are accustomed to publishing in high prestige toll access journals. The phenomenon will, in my view, have less impact on less established researchers who now tend to see open access as the better publishing option. It may somewhat slow the overall adoption of open access as the primary business model for scholarly journal publishing, but not change the inevitable growth of open access and eventual decline of toll access.

*Question Three: If Sci-Hub enhances the impact factors of toll access journals, might the publishers of these journals be better off leaving Sci-Hub in place even as they continue to complain loudly about the site's piracy in public?*

Toll access publishers in the pre-Sci-Hub world faced a dilemma. Toll access journal publishers operate in two markets. One is the market to attract the best articles from authors. The second is the market to sell their journals to libraries or articles to individuals. In the second market the journals are a monopoly good and if the journal is important libraries have to buy it and pay the asking price. As noted above individual users have some options, but if the need is immediate these options are limited. But in the market to acquire high quality articles from authors the exclusivity imposed by toll access has a downside. For the authors what is important is board availability and the citation advantage this brings. That the open access citation advantage is real and understood to be so is a disadvantage to toll access publishers in this market. Given this it might make sense for toll access publishers to complain loudly, but to tacitly accept and not vigorously fight Sci-Hub. Such a stance allows for the open access citation advantage to accrue to toll access articles, which will help keep authors happy.

As long as libraries are unprepared to rely on Sci-Hub, and most, because of the obvious legal concerns, are not, then subscription dollars will continue to follow. There would seem to be no downside to this strategy as a short term strategy for toll access publishers.

*Question Four: If it is true that many Sci-Hub users are drawn to the site because it is easier to use than paywalled publisher's sites, will this change in use patterns justify reductions in library subscriptions based on reduced use? Or, to frame the question differently, will faculty complain about library journal cuts if they mostly rely on Sci-Hub to fill their need for journal articles?*

There would seem to be little doubt that Sci-Hub will negatively impact the sales of individual toll access journal articles. At \$30 or more a shot this market is likely limited anyway.

The more important question will be: Will Sci-Hub, because it is a one stop easy to use site, pull use from toll access sites even when the libraries at the user's institution have purchased access? That is, will researchers who have access to journal content that their libraries have paid for still use Sci-Hub because it is faster and easier than the access the library can provide? There is anecdotal evidence that this may be happening. John Bohannon documents 68,000 Sci-Hub downloads in the six months from September 2015 and February 2016 from East Lansing, Michigan the home of Michigan State University. Even though libraries are unlikely to rely on, publically recognize or promote Sci-Hub, because of the obvious legal concerns, to the extent researchers use Sci-Hub and become less reliant library purchased toll access journals, libraries will find it easier to cut subscriptions based on their lower use. This is a real threat to toll access journal publishers and, assuming Sci-Hub continues, is likely to impact them in the next five to ten years.

## Conclusion

Sci-Hub has, for all practical purposes, made all of the world's scholarly literature open access. This is likely to have a number of interesting impacts. It is likely that there will be a Sci-Hub impact that will diminish, though probably not eliminate the open access citation advantage. This will likely preserve the impact factors of many toll access journals longer than might have been anticipated in a world without Sci-Hub. In the end though Sci-Hub will, because of its comprehensiveness and simple interface erode use of toll access journals in library collections, which will in turn make it easier to justify subscription cancellations by libraries.

Sci-Hub's impact on the demand side of scholarly journal use can be predicted. In the mid to longer term this will have a negative impact on the toll access publisher's ability to provide articles. Since Sci-Hub exists to make this content available, its success could ultimately be its undoing. What is hard to predict is what impact, if any, Sci-Hub will have on the supply side for open access publishers. Sci-Hub might serve as a useful aggregator of open access content. Its use would reduce download counts from publisher's sites, but by providing easy access to the content, it should help expand other metrics.

We are living in interesting times, and as Clay Shirky has said, “That is what real revolutions are like. The old stuff gets broken faster than the new stuff is put in its place.”<sup>7</sup>

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- <sup>1</sup> See for example: Gunther Eysenbach, “Citation Advantage of Open Access Articles,” *PLOS Biology* May 16, 2006, DOI: 10.1371/journal.pbio.0040157; C. Hajjem, S. Harnad and Y. Gingras, “Ten-Year Cross-Disciplinary Comparison of the Growth of Open Access and How it Increases Research Citation Impact,” August 15, 2006 arXiv:cs/0606079v2 <https://arxiv.org/abs/cs/0606079>; Michael Norris, Charles Oppenheim and Fytton Rowland, “The Citation Advantage of Open-Access Articles,” *Journal of the Association for Information Science and Technology* July 9, 2008, DOI: 10.1002/asi.20898; Alma Swan, “The Open Access Citation Advantage: Studies and Results to Date,” 2010, <http://eprints.soton.ac.uk/268516/>; Xianwen Wang, Chen Liu, Wenli Mao and Zhichao Fang, “The Open Access Advantage Considering Citation, Article Usage and Social Media Attention,” *Scientometrics* 103(2): 555-564 May 2015, DOI: 10.1007/s11192-015-1547-0, and Amy Atchison and Jonathan Bull, “Will Open Access Get Me Cited? An Analysis of the Efficacy of Open Access Publishing in Political Science,” *PS: Political Science & Politics* 48(1): 129-137 January 2015, DOI: 10.1017/S1049096514001668.
- <sup>2</sup> Arthur Sale, Marc Couture, Eloy Rodrigues, Less Carr and Steven Harnad, “Open Access Mandates and the ‘Fair Dealing’ Button,” 2014, <http://eprints.soton.ac.uk/268511/>
- <sup>3</sup> “ICanHazPDF,” Wikipedia, <https://en.wikipedia.org/wiki/ICanHazPDF>
- <sup>4</sup> “Sci-Hub,” Wikipedia, <https://en.wikipedia.org/wiki/Sci-Hub>
- <sup>5</sup> John Bohannon, “Who’s Downloading Pirated Papers? Everyone,” *Science* April 28, 2016, DOI: 10.1126/science.aaf5664
- <sup>6</sup> John Bohannon, “The Frustrated Science Student Behind Sci-Hub,” *Science* April 28, 2016, DOI: 10.1126/science.aaf5675
- <sup>7</sup> Clay Shirky, “Newspapers and Thinking the Unthinkable,” March 2009. Available at: <http://www.shirky.com/weblog/2009/03/newspapers-and-thinking-the-unthinkable/>