

## The OA Interviews: Michael Eisen, co-founder of the Public Library of Science

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[Michael Eisen](#) is an evolutionary biologist at [University of California Berkeley](#) and an Investigator of the [Howard Hughes Medical Institute](#). He is also co-founder of the Open Access (OA) publisher Public Library of Science ([PLoS](#)).

Founded in 2000, PLoS was conceived as an advocacy group for what only later became known as Open Access. PLoS' first initiative was to publish an [Open Letter](#) and invite scientists around the world to sign on to it.

Those signing pledged that henceforth they would “publish in, edit or review for, and personally subscribe to only those scholarly and scientific journals that have agreed to grant unrestricted free distribution rights to any and all original research reports that they have published, through [PubMed Central](#) and similar online public resources, within 6 months of their initial publication date.”

Nearly 34,000 scientists from 180 countries signed the pledge; but while a small handful of publishers complied with the demands outlined in the letter, most blithely ignored it. Worse, most of the scientist signatories proved happy to forswear their own pledge, and continue publishing in the very journals that had turned a deaf ear to them.

Disappointed but undeterred, Eisen and the other two PLoS co-founders – biochemist [Patrick Brown](#), and Nobel Laureate [Harold Varmus](#) – reinvented the organisation as a non-profit publisher, and in 2003 they launched an OA journal called [PLoS Biology](#). [PLoS Medicine](#) followed a year later.

### *PLoS ONE*

Today PLoS publishes seven OA journals and is also experimenting with new OA services like [PLoS Currents](#), which aims to minimise the delay between the generation and publication of new research. Papers are published within days of being submitted.

PLoS was able to become a publisher thanks to a [\\$9 million grant](#) it received in 2002 from the [Gordon and Betty Moore Foundation](#). The challenge was to become financially sustainable before the grant ran out.

With this aim in mind, PLoS decided to levy a one-off article-processing charge ([APC](#)) for each paper it published. This avoids having to charge a subscription to those who want to access PLoS papers. Instead, the publisher can make all the papers it publishes freely available on the Web. Later dubbed [Gold OA](#), this approach was originally pioneered by commercial OA publisher BioMed Central ([BMC](#)).

Many were sceptical that such a model could work, and not without reason: PLoS initially [struggled](#) to pay its way. But in 2006 the publisher launched *PLoS ONE*, a new journal that was not only radical in concept, but was to prove a financial saviour.

*PLoS ONE* is revolutionary in two ways. First, where journals are normally discipline specific *PLoS ONE* will consider any paper in any discipline within the hard sciences. Second, reviewers are told only to assess the technical validity of papers submitted, not their likely scientific importance or significance.

It turned out to be a winning formula, and *PLoS ONE* grew so rapidly that it is now the largest peer-reviewed journal in the world. It has published [over 31,000](#) papers since 2006, 14,000 of them in 2011 alone, which represents 1 in 60 of all the papers indexed by [PubMed](#) that year.

Importantly, thanks to *PLoS ONE*, the publisher was able to announce last year that its annual operating revenues in 2010 had exceeded expenses for the first time.

But success has not come without controversy. Critics [accuse PLoS](#) of engaging in “bulk, cheap publishing of lower quality papers to subsidize its handful of high-quality flagship journals.” By doing so, they add, it is lowering the quality of published research.

Undoubtedly, the acceptance bar is much lower at *PLoS ONE* than at other journals. Where *The Lancet* and the *New England Journal of Medicine* accept [fewer than 10%](#) of papers submitted, for instance, *PLoS ONE* [publishes around 65%](#) of the papers it receives.

However, as the potential financial benefits of the *PLoS ONE* model became evident, traditional commercial publishers rushed to create *PLoS ONE* clones themselves. Today, therefore, *PLoS ONE* is as likely to be celebrated for pioneering a new type of megajournal as it is to be criticised for its no-frills peer review.

## Research Works Act

But although subscription publishers have begun to warm to Gold OA, they remain deeply suspicious about the OA movement, particularly those who advocate so-called [Green OA](#), or self-archiving – in which researchers continue to publish in traditional journals but then post their papers on the Web.

In other words, rather than paying to publish in an OA journal, a researcher may choose to publish (without charge) in a subscription journal, and then make the paper freely available in an [institutional repository](#), or subject-based repository like [PubMed Central](#).

Since self-archiving is parasitic on subscription journals, publishers have become increasingly antagonistic towards it, particularly as more and more research funders and institutions decide to [mandate](#) their researchers to self-archive (normally after an embargo period).

Publishers complain that this threatens the sustainability of the current publishing system, and so could destroy the peer review process on which the research community depends.

Their particular *bête noire* is the [Public Access Policy](#) introduced in 2005 by the US National Institutes of Health ([NIH](#)), the [largest source of funding for medical research in the world](#). The policy requires that all NIH-funded researchers make their papers freely accessible in PubMed Central no later than 12 months after publication.

Determined to overturn the NIH policy, publishers have in recent years lobbied lawmakers to introduce legislation that would outlaw it. As a result, the “[Fair Copyright in Research Works Act](#)” has been introduced twice in the US House of Representatives (in 2008 and 2009), although without success.

Then at the end of last year a reworked Research Works Act ([RWA](#)) was introduced by Representatives [Darrell Issa](#) (R-CA) and [Carolyn Maloney](#) (D-NY). Like the earlier bills, the RWA

would roll back the NIH Public Access Policy. It would also prevent other US federal agencies from introducing similar mandates.

Since the RWA is an attack on Green, rather than Gold OA, it does not pose a direct threat to PLoS. Nevertheless, earlier this year Eisen began a campaign to stop the bill. This was no doubt partly motivated by a commitment to the principle of OA, but it was also an ideal opportunity to promote Gold OA, and thus PLoS.

In [an editorial](#) published in the *New York Times* on 10th January, for instance, Eisen called on researchers to “cut off commercial journals’ supply of papers by publishing exclusively in one of the many ‘open-access’ journals that are perfectly capable of managing peer review (like those published by the Public Library of Science, which I co-founded).”

Additionally, he added, “Libraries should cut off their supply of money by canceling subscriptions. And most important, the N.I.H., universities and other public and private agencies that sponsor academic research should make it clear that fulfilling their mission requires that their researchers’ scholarly output be freely available to the public at the moment of publication.”

Five days before his NYT editorial, Eisen had [reported on his blog](#) that a number of senior Elsevier executives had donated money to Rep. Maloney. “It is inexcusable that a simple idea – that no American should be denied access to biomedical research their tax dollars paid to produce – could be scuttled by a greedy publisher who bought access to a member of Congress,” he complained.

Sensing a potential PR disaster, a number of publishers rapidly [distanced themselves](#) from the RWA. Nevertheless, the bill has been [welcomed](#) by the American Association of Publishers ([AAP](#)). Since the AAP has some 300 members we can assume that many publishers support the RWA. Others publishers besides Elsevier will doubtless also have donated money to lawmakers.

Yet it was Elsevier that Eisen mainly targeted – on the grounds, he told me, that “[t]heir fingerprints are all over this bill”.

Further fanning the flames, Eisen has [suggested](#) that Elsevier’s vice president and head of global corporate relations [Tom Reller](#) has drafted publicity text about the RWA for Congresswoman Maloney. He has also [designed an image](#) for a “Boycott Elsevier” t-shirt (and [here](#)).

By publicly calling out Elsevier in this way, Eisen has sparked a widespread revolt against the publisher. Amongst other things, this has led to the creation of a [boycott site](#) that, as of this writing, has attracted around 6,500 signatures. Those signing it pledge not to publish in, or referee and/or perform editorial services for any Elsevier journals.

Only latterly has Eisen begun to point out that this is not just about Elsevier – suggesting, for instance, that the boycott should not have targeted only one publisher. “I wish they hadn’t focused exclusively on Elsevier,” he [commented](#) on his blog at the beginning of February. “[T]hey are hardly the only bad actors in the field.”

Eisen has also [welcomed](#) the re-introduction of the Federal Research Public Access Act ([FRPAA](#)). The FRPAA is a counter bill to the RWA. If passed it would require all the major agencies of the US federal government to introduce NIH-style mandates. In addition, the embargo period would be shortened to six-months.

However, Eisen has not had things all his own way. When, for instance, he responded to a post about the RWA on [The Scholarly Kitchen](#) blog (which is sponsored by the [Society for Scholarly](#)

[Publishing](#)), he came under fire from the author of the post [Kent Anderson](#), who repeated the now familiar criticisms of *PLoS ONE*.

“PLoS can publish very good journals (Medicine, Biology) when it adheres to traditional benchmarks of quality,” [wrote Anderson](#). “However, these don’t make money for PLoS, so your organization had to lower its rejection rates severely and lower standards, two things that are completely predictable in your model if you’re cynical about it. To dress it up as “holier than” any other model is deceitful.”

In a heated public exchange with Anderson, Eisen gave as good as he got. But when it became too bad tempered Anderson responded by [closing comments](#) on the post, leaving Eisen with no option but to [post](#) insults on his twitter feed. It was not entirely clear who was more bruised by the exchange.

## Implications

As the row over the RWA has grown in scale and vitriol, we are left wondering where PLoS, and particularly *PLoS ONE*, fit into the larger picture, and what it means for OA. As we noted, the bill is not a direct threat to PLoS. Indeed, it could, as Eisen hopes, encourage more researchers to embrace Gold OA.

But if researchers did take Eisen’s advice and boycotted subscription publishers in favour of OA journals, and did so in very large numbers, what implications might it have?

As a megajournal unconstrained by discipline, we could expect that many researchers would turn to *PLoS ONE* if they wanted to publish in an OA journal, particularly if they knew that there was a 65% chance of getting their paper published by doing so. But could *PLoS ONE* cope with a huge influx?

Eisen is confident it could. “[W]e have huge efficiencies of scale, and I think we could, in principle, handle the entire volume of scientific literature in the world”, he told me.

However, insiders point out that the PLoS editorial system has in the past struggled to cope. And while a new system was put in place in 2010 there have been further difficulties. These may just be teething problems, but we might want to take with a pinch of salt any claim that *PLoS ONE* can handle a limitless number of papers.

If PLoS did become overloaded, we might expect to see researchers flock to the growing number of what [Jeffrey Beall](#) has dubbed “[predatory](#)” [OA publishers](#). These are new publishers that have emerged in recent years specifically in order to cash in on Gold OA’s pay-to-publish model, but whose peer review and publishing processes appear in many cases to be woefully inadequate (e.g. see [here](#) and [here](#)).

And if the RWA spat did trigger a sudden “gold rush” it would likely draw attention to another long-standing issue. We should not forget that many of those who decided to support OA did so in the belief that it would solve the [affordability problem](#) that has seen the research community increasingly struggle to pay the costs of disseminating its research.

The claim was that OA publishing would be cheaper than subscription publishing. It was as a result of this belief, perhaps, that one of the principle reasons given for launching a boycott against Elsevier was – [in the words](#) of UK mathematician [Timothy Gowers](#) – that it “charges very high prices.”

However, a glance at BMC's [APC Comparison Chart](#) shows that choosing to publish a paper in an OA journal is not necessarily cheap either, and can cost as much as \$5,000 a shot (certainly if a researcher opts for [Hybrid OA](#)).

And while PLoS' fees are by no means the most expensive, it is worth noting that, at launch, *PLoS Biology* and *PLoS Medicine* charged a "[modest](#)" fee of \$1,500. Nine years later this fee has increased in price by 93%, to \$2,900.

Because it offers a no-frills review process, *PLoS ONE* is less expensive (\$1,350). Nevertheless, while Eisen maintains that "the marginal cost of processing an article is going down, and will continue to do so, asymptotically approaching zero" *PLoS ONE*'s APC has also grown over time, and is now 8% more expensive than when the journal launched.

(For purposes of comparison, a typical BMC journal like the *Journal of Translational Medicine* initially [charged \\$525](#). Today it charges [\\$1,970](#) – a 275% increase).

It is hard not to conclude, therefore, that Gold OA is unlikely to deliver on its price promise. We might also be justified in assuming that it will succumb to the same inflationary process that has made the research community so angry about subscription publishing.

[Some argue](#) that it is precisely the rise of megajournals like *PLoS ONE* that will drive down prices. However, it is not clear how offering a no-frills service at a lower price will lead to a fall in overall costs, particularly if higher acceptance rates lead to a greater number of papers being published, and thus an increase in the research community's bills. It also does not help if that journal charges more than is justified for the service it provides.

Others maintain that the affordability problem is confined to biomedicine. This is argued, for instance by [David Solomon](#) and [Bo-Christer Björk](#) in a recent [study](#) that estimates the average APC at \$906. However, the study included many journals that are based in the developing world and cater to local authors, as well as journals published by predatory OA publishers.

## Whence the costs?

All this invites an important question: Why is scholarly publishing so expensive?

Subscription publishers have tended to argue that the bulk of the costs arise from the work required to manage the peer review process, particularly in an online environment where there are no print costs.

Eisen, by contrast, implies that PLoS' fees primarily arise from the technology costs associated with handling papers, not peer review. However, he maintains, these costs are falling, "because of increasing use of technology to convert manuscripts that come in from authors into publication-ready XML, HTML and PDFs."

When I asked why – if costs are falling – *PLoS ONE*'s APC has not dropped to reflect the fall, he replied, "Our costs for *PLoS ONE* haven't dropped that much yet because every paper still requires manual attention. As we achieve more automation, our costs and charges to authors will drop accordingly."

Yet while Eisen says that *PLoS ONE*'s costs have already dropped (some), its prices have not gone down, but risen.

PLoS critics, of course, would express no surprise at this, and would doubtless remind us that the journal was not intended to reduce the cost of scholarly publishing, but to subsidise PLoS' wider operation.

When I raised this claim with Eisen he responded, “[W]e spend more money on staff and direct expenses for *PLoS Biology* and *PLoS Medicine* than we take in on page charges for those journals by a million dollars or so. And we correspondingly take in more on page charges for *PLoS ONE* than we spend on *PLoS ONE* staff and publishing costs.”

However, he added, it is too simplistic to argue that *PLoS ONE* subsidises the other journals, since it also benefits from them. “For example, *PLoS ONE* gets a lot of papers referred from *PLoS Biology*, *PLoS Medicine* and the community journals. The revenue comes to *PLoS ONE*, but there are significant costs borne by the other journals.”

All in all, the suspicion must be that publishers will continue to ask the research community to pay more than it is able or willing to afford to publish its papers – unless a more drastic change takes place. Certainly wide scale take-up of Gold OA does not appear to offer a solution to the affordability problem.

On the one hand, the research community insists the problem is that publishers are too greedy, and so charge too much. On the other, publishers argue that the research community is simply unwilling to pay a fair price for an essential service.

Interestingly, one might feel the latter argument is implicit in one of Eisen’s comments to me. “Publishing costs money, and that money has to come from somewhere,” he told me. “As has been said in many places, the differences between open access and closed/subscription access is in how the organizations that support research pay for publishing.”

Right now we do not know what the outcome of the current revolt will be. It could lead to a mass take-up of Gold OA, or it may simply fizzle out – as happened when PLoS persuaded 34,000 researchers to sign its open letter in 2001. But it is hard to see how the former outcome would address the problem that led many to embrace OA in the first place.

## Another scenario

There is, however, another possible scenario. Instead of sparking a mass conversion to Gold OA, the revolt might trigger a Green revolution. Some would feel that to be a more appropriate response to an attempt by publishers to outlaw self-archiving mandates. And in fact that is what is being [called for](#) right now at the [London School of Economics](#).

Meanwhile over at the [Math2.0](#) site researchers are mulling a number of options, none of which appear to involve Gold OA – which is described by one denizen of the site as an “[author-paid-fee criminal practice](#)”.

Amongst the various ideas being discussed is a campaign to encourage [self-archiving](#) specifically to “destabilize the current system”. There is also a proposal to create [overlay journals](#) based on papers posted in the pre-prints server [arXiv](#). And yet another proposal calls for the [development of researcher-controlled journals](#) using [Annotum](#) – “an open-source, open-process, open-access scholarly authoring and publishing platform based on WordPress.”

Could the revolt sparked by Eisen develop into a more far-reaching rebellion than he called for? If history is any judge, probably not: OA advocates have been prematurely [calling the tipping point](#) for OA for some time now.

Nevertheless, as the likely financial implications of embracing Gold OA become more apparent, there is a growing sense that, if scholarly communication is to properly exploit the online environment, a more root-and-branch change will be needed.



What better evidence of this, perhaps, than the conclusion reached by one-time Elsevier employee – and former BioMed Central publisher – [Jan Velterop](#). Speaking to me recently, Velterop [argued](#) that the time has come for the research community to abandon pre-publication peer review in favour of something more like the “[endorsement](#)” model pioneered by ArXiv.

Essentially, he explained, this would mean, “replacing the ‘filter first, then publish’ by ‘publish first, then filter’”. The entire web works that way, and the exceptionalism of scientific publishing is no longer plausible, in my view.”

Were the research community to take this step, he added, it could hope to save “in the order of \$3 billion a year”.

Ironically, Velterop’s views on peer review are very similar to those of Eisen, who has [described](#) pre-publication peer review as a “conservative, cumbersome, capricious and intrusive” process that “slows down the communication of new ideas and discoveries, while failing to accomplish most of what it purports to do”; and so, he told me, it should be “more or less completely” done away with.

There can be no doubt that *PLoS ONE* is a highly innovative service, and has proved extraordinarily popular. And there can be no doubt that Eisen is hugely proud of PLoS’ achievements, and genuinely wants to see scholarly publishing revolutionised.

But here is the kicker: Velterop reports that it costs arXiv just \$7 to publish a paper. *PLoS ONE* still charges \$1,350.

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Michael Eisen

### The interview begins ...

**RP:** *PLoS ONE* is now five years old. Since 2006, it has published around [30,000 papers](#), over 14,000 of them in 2011 alone, representing 1 in 60 of all the papers indexed by [PubMed](#) during the year. As such, *PLoS ONE* is now the largest peer-reviewed journal in the world, and the first of what people are now calling the “megajournal”. Numbers aside, what for you has been *PLoS ONE*’s biggest achievement, and what has been the biggest disappointment?

**ME:** I think the biggest achievement of *PLoS ONE* is not the raw number of papers it has published, but rather the number of really interesting, exciting and important papers it has published.

One of the big concerns at the start was that *PLoS ONE* would be a kind of bottom feeding journal – publishing good but not significant papers that had been through the ringer at other journals and which authors just wanted to dump somewhere. And while some papers in *PLoS ONE* undoubtedly have this pedigree, I've been impressed from the outset at the number of really outstanding papers we've gotten and published – and at how many of these were submitted first to *PLoS ONE*.

The quality of and interest in these papers is born out by how frequently they are covered in the popular press, by the glossy science weeklies (the write-ups of papers from other journals in [Nature](#) also routinely include *PLoS ONE* papers), and by the surprisingly high (even to us) impact factors that *PLoS ONE* received.

One important reason for the high quality of papers we've gotten is that people really love the experience of publishing in *PLoS ONE*. With only a handful of exceptions, everyone I've spoken to who has submitted papers to *PLoS ONE* has said it was a great experience (and it's not like people aren't willing to tell me they don't like something – I hear all manner of complaints about their experiences with [PLoS Biology](#)). They love just being able to get their story out, quickly, and with a limited amount of interference from reviewers and editors, save that necessary to establish the validity of the results and claims.

The biggest disappointment is also clear. One of the several goals of *PLoS ONE* – and something that is essential for the long-term success of the model – was to catalyze post-publication commentary, discussion and assessment of published works. Although we built the functionality into the publishing platform we developed for *PLoS ONE*, it is very, very poorly used.

Honestly, this isn't that big of a surprise. I wasn't really happy with how the system worked, and, what's more, I don't think it's reasonable to expect to create a culture of commenting or rating that is only active for PLoS papers.

People don't navigate the literature that way, and the next generation of our system will have to give people the easy ability to record their thoughts on ANY paper that they are reading if it is to be successful.

**RP: Can you list a few of the outstanding papers published in *PLoS ONE*?**

**ME:** This is just a random sampling of things that came into my mind this moment. There are many, many more.

We published an incredibly [cool one](#) at the beginning of this year announcing the discovery of the world's smallest known vertebrate species – a frog whose adults are less than 1cm long. This is just the latest in a large number of fantastic papers from the systematics community that have appeared in the journal.

Then there is [this paper](#) from Benjamin Zusman about double-stranded RNA anti-virals, and [this one](#) (from [my brother's lab](#)) about a potential 4<sup>th</sup> domain of life.

Finally, at the risk of being salacious, I really liked [this paper](#) on bat fellatio. It reflects a common thread in a lot of *PLoS ONE* articles highlighting that science can be fun – that not every great paper has to be “significant” in the narrow way that might appeal to [Science](#) or [Nature](#).

**RP: How significant is it that *PLoS* was able to announce last July that its annual operating revenues in 2010 exceeded expenses for the first time?**



**ME:** The financial success of PLoS and BMC is arguably the single most significant event in journal publishing in the last decade, because it undermines the biggest argument publishers use to justify their refusal to switch to open access, namely that OA is a naïve ideal that wouldn't work in the "real world" where publishing is a business, and publishers have to pay their bills and make a profit.

Well, PLoS has clearly proven that this critique was wrong. Not only is *PLoS ONE* breaking even, so are our community journals. And it's not just PLoS. BioMed Central became profitable several years ago, enough so that it was bought by [Springer](#), who are hardly a bunch of bleeding heart do-gooders.

So it is VERY significant.

### Cash cow?

**RP:** *Industry observers have argued that PLoS would likely not have survived financially had it not launched PLoS ONE, which they characterise as a "cash cow" for PLoS. Do you agree with this interpretation?*

**ME:** When Pat, Harold and I decided to form PLoS, our overarching goal was to transform scientific publishing in several interrelated ways – most significantly to have every paper be open access, and to decouple the acts of publication and assessment.

These goals were embodied in *PLoS ONE* – and thus, from the beginning, every aspect of our strategy, including our strategy to achieve long-term financial stability, was built around *PLoS ONE*.

So, yes, it is absolutely true that the path we chose to pursue required that *PLoS ONE* be a financial success – because it was built around *PLoS ONE*.

I realize that many of the people who point this out mean it as a bad thing – that the role *PLoS ONE*'s success plays in our finances somehow diminishes the impact of our other successes. So it's worth pointing out that other parts of our publishing operation are financially successful as well – all of the community journals ([PLoS Genetics](#), [PLoS Pathogens](#), [PLoS Computational Biology](#)) break even or generate a small surplus.

And I must say that I find it somewhat ironic and amusing that many of the same people who dismissed PLoS (and open access in general) as being the brainchild of naïve idealists who didn't understand their business, are now criticizing us for being TOO successful as a business.

**RP:** *How important to the success of PLoS ONE do you think it was that a) PLoS began by establishing two successful traditional journals (PLoS Biology and PLoS Medicine) and b) one of the PLoS co-founders (Harold Varmus) was a former NIH director and Nobel laureate?*

**ME:** It's impossible to really know how important either of these things were. When Pat, Harold and I were having our initial conversations about PLoS, we seriously considered going straight for something like *PLoS ONE*.

But, given the poor reception Harold's [eBioMed proposal](#) had received, we felt that, strategically, it was better to try to bring people along slowly by first introducing them to open access in a familiar context (the traditional highly selective journal), and, when they were comfortable with open access, *PLoS ONE* wouldn't seem as frightening.

Given the success of *PLoS ONE*, I think this was the right strategy. Plus, it's also clear that people view the PLoS "brand" as being a reason they like *PLoS ONE* – something we wouldn't have had without *PLoS Biology*, [PLoS Medicine](#) and the [community journals](#).

As to whether it mattered that Harold was former NIH director and Nobel laureate, I really have no idea. It certainly helped people to take us seriously – both in terms of getting funding, and support from the scientific community. We made a real commitment from the beginning to get high-profile members of the scientific establishment to back what we were doing, and where many of these people viewed Pat and me as flame throwing radicals, they couldn't help but take Harold more seriously.

That said, Harold's real contributions were not his title or his Nobel, but his ideas and unflagging dedication to the cause, his experience running organizations (something neither Pat nor I had), and his near constant evangelism for PLoS and open access in general.

**RP: *What does the success of PLoS ONE tell us about the current state of scholarly publishing, and what does it portend for the future?***

**ME:** The fact that a journal that didn't exist five years ago and that offers a somewhat radical new model for publishing has grown from nothing to the biggest journal in the world suggests above all else that the industry is not serving its customers very well and that there was – and still is – a strong desire for something new.

*PLoS ONE* has, obviously, tapped in to this. But there remains a huge opportunity for publishers – PLoS and others – who provide authors with more effective and efficient ways to get their science out.

**RP: *Certainly PLoS ONE has triggered a wave of me-too clones from other publishers, including from commercial publishers like Nature, BMJ, Cell Press, and Sage. You have described these PLoS ONE clones as "direct ripoffs that seek to capitalize on the business model we have established." What for you are the positive aspects of this copycat activity, and what do you see as the negative aspects?***

**ME:** I tried to be pretty clear in the blog post you cite that I LOVE the fact that the *PLoS ONE* business model is being ripped off.

It was never our objective to take over the publishing world. Rather, our goal was to catalyse a transition from closed access to open access publishing by providing successful examples of open access journals for other publishers to emulate. And that is exactly what has happened. So I am all for it.

The only negative aspect I see in this is that not all of these clones are fully embracing open access. Several, in particular, are using non-commercial licenses that, ironically, limit PLoS's ability to do new and interesting things with their content. But I think this will pass.

It's possible to also see a business threat in the launch of *PLoS ONE* clones. But, at least in the short run, I think their existence is just going to grow the pool of articles that are being published in this type of journal, and increase the respectability of this mode of publishing.

Obviously, we can't continue doubling our volume every year forever. And eventually, we'll be competing with other publishers. But I am confident that as long as PLoS remains innovative and constantly pushes to make the experience of publishing in our journals and reading our content as good as possible, we'll be fine.

## Challenges

**RP:** *What challenges has PLoS ONE's rapid growth posed for the organization and for its publication process, and do you believe that (demand aside) the model is limitlessly scalable?*

**ME:** We've run in to a few technical challenges with scaling infrastructure, but they've been fairly easy to deal with. It's obviously not entirely trivial to deal with an editorial board of 1,000s of scientists, and to make sure we stay on top of the status of the several thousand papers that can be in our system at a time. But, again, these are fairly trivial challenges compared to those faced by other fields, and we've learned a lot from the way other people do things.

As to its scalability, remember that the scientific community already has structures in place to deal with the flow of papers that go into the thousands of research journals that exist out there. At the level PLoS ONE has reached we have huge efficiencies of scale, and I think we could, in principle, handle the entire volume of scientific literature in the world. I'm not saying we SHOULD – there is tremendous value in having diversity of options for authors – I just don't think scaling is going to be a major problem.

**RP:** *You described PLoS ONE as a financial success. Can we clarify what that means? I assume you are not simply saying that PLoS ONE recovers its costs, but that it makes a profit and so, as commentators maintain, subsidizes the larger PLoS endeavour. I do not think the financial information that PLoS publishes breaks down the figures for its various products. Are you able to say exactly what financial contribution PLoS ONE makes to the organization? And can you say how much of the \$1,350 PLoS ONE charges to publish a paper goes towards covering costs, and how much of it represents a surplus for PLoS?*

**ME:** Although this sounds fairly straightforward, none of these things are easy to quantify. If we look at it naively, we spend more money on staff and direct expenses for PLoS Biology and PLoS Medicine than we take in on page charges for those journals by a million dollars or so. And we correspondingly take in more on page charges for PLoS ONE than we spend on PLoS ONE staff and publishing costs.

But it isn't really accurate to break things out this way. For example, PLoS ONE gets a lot of papers referred from PLoS Biology, PLoS Medicine and the community journals. The revenue comes to PLoS ONE, but there are significant costs borne by the other journals (especially the flagships, which have professional editors).

We can try to account for this, but it's not trivial. And it's even more difficult to account for the impact that the PLoS brand built and maintained by PLoS Biology & PLoS Medicine.

All that said, we are committed to being open with our finances, and are in the process of breaking these numbers out in a digestible form so that other publishers can understand the real economics of open access publishing and decide if and how they can adapt it for their purposes.

**RP:** *Some researchers have started to question why it costs \$1,350 to publish a paper with PLoS ONE. When PLoS posted its 2010 Update, for instance, someone calling themselves Dr Science [commented](#) on the PLoS blog, "While your fees are no doubt in line with current publication charges in the sciences, they are \*completely\* egregious compared to the humanities – where the mode fee is 'zero'. These fees make a mockery of 'open access', and I'm very surprised that you haven't addressed them." I don't think anyone from PLoS responded to that comment. Would you?*

**ME:** Dr. Science is confused on several fronts. The reason humanities journals don't charge authors is that they generate their revenue from subscriptions. PLoS doesn't. And we have never argued that "open access" means "free".

Publishing costs money, and that money has to come from somewhere. As has been said in many places, the differences between open access and closed/subscription access is in how the organizations that support research pay for publishing.

## Quality

**RP:** *The model pioneered by PLoS ONE is that reviewers are asked to assess only the technical validity of a paper, not whether it is scientifically important or significant. I know PLoS believes that this does not mean the research it publishes is of lower quality. Nevertheless, many appear to have concluded that PLoS ONE has lowered the quality bar. How do you respond to these claims?*

**ME:** I think these people are wrong. If anything, it has been my experience that, by absolving reviewers of the burden of assessing the significance of a work, they are able to place more attention on its validity.

Of course our review process is not perfect, and there will be some papers published that are ultimately realized to be below our standards. But this is hardly unique to PLoS ONE. I would point to a series of papers published in *Science* over the past year whose quality has been widely critiqued (e.g. [arsenic bacteria](#), [longevity GWAS](#), [human RNA editing](#)).

I would encourage anyone who feels this way to read a good sampling of PLoS ONE papers in their field. I think they'll be pleasantly surprised by the quality of the papers.

**RP:** *I have been told that some of PLoS ONE's academic editors worry that they have to accept papers that they do not believe offer any real value to the progress of science or the research corpus. How would you assuage such anxieties?*

**ME:** We do not encourage the publication of papers that do not contribute to the progress of science. However, we believe that, as a general rule, when an experiment has been done where the methods are sound and reproducible, the data are reliable, and the conclusions justified by the data that the progress of science is best served if the experiment is published.

**RP:** *The PLoS ONE model was posited on the belief that meaningful peer review can only take place after publication, not before. It is for that reason that PLoS ONE reviewers are only asked to consider whether a paper is technically sound. However, as you indicated, post-publication peer review has never really taken off. You also said that the long-term success of the model relies on that happening. Does this mean that the raison d'être of PLoS ONE has been undermined in your view?*

**ME:** I assume when you say "peer review can only take place after publication" you are referring to peer review with the goal of predicting the impact of a paper. It isn't quite right to say that this can only take place after publication – only that at PLoS ONE any assessment of significance is not a factor in the publishing decision, but it can very easily take place prior to or alongside publication.

However the general gist of the question is right, in that it was and is a major goal of PLoS ONE to develop a robust system for capturing reviewer opinions of the quality, impact and audience of a work – with such reviews beginning at the time of publication and continuing throughout the useful life of the paper.

And there is no doubt that this has not taken off at all. As I said above, this is somewhat understandable in that a) I don't think the system we built really hits the mark in terms of the functionality it will take to do this well and b) because, until this year really, there hasn't been a large enough body of literature to which we could apply such a system. This is the next frontier in publishing, in my opinion – and it's something I hope PLoS will be focused on in a big way in the coming years.

**RP:** You have [described](#) peer review as being, “conservative, cumbersome, capricious and intrusive” and said that it “slows down the communication of new ideas and discoveries, while failing to accomplish most of what it purports to do.” Why then bother with peer review at all?

**ME:** Just to be clear – in those quotes I was referring to the system of pre-publication peer review that we have today. This I think we can and should more or less completely do away with – leaving only a very thin process for screening submitted articles to make sure they're appropriate and real works of science.

However, I believe strongly in a more general notion of peer review – scientists recording and sharing their opinions and ideas about any paper they read – be it at the time of publication or 100 years later.

This needs to be our goal, and if we do this effectively, then pre-publication peer review will be completely irrelevant and will have been replaced by something infinitely more useful.

## Utopian journal

**RP:** Last June the [Wellcome Trust](#), the [Howard Hughes Medical Institute](#) and the [Max Planck Society](#) announced plans to launch a new OA journal called [eLife](#). Some view this an attempt to address the claim that OA publishing means lower quality and high publishing costs for authors. As a PLoS ONE academic editor put it to me, “This new journal seems to be solving most of the problems raised about OA journals: It will emphasize high quality and commit to OA but will be funded by the big agencies to waive article fees. So, it's a utopian journal in some sense....” Would you agree, and what challenges do you think eLife will face?

**ME:** I think eLife is great. It has long been my view that the funders of science have been far too reluctant to acknowledge that problems in scientific publishing diminish the value and impact of the research they publish.

I have long urged both public and private funders of research to engage directly in the process and state, unambiguously, that their interests are best served when all of their research is published in open access journals, and fully fund the costs of open access publishing. And now, this is exactly what they're doing.

In the long run we should move to a system in which assessment of impact is decoupled from the primary act of publication. But I believe the launch of eLife will be a transformative point in the history of OA, as it should appeal to even the most conservative of scientists and make everyone feel comfortable publishing in OA journals.

As to challenges, I think the biggest one will be that they will get inundated with papers and they will have to deal with their own success. But I'm confident they will.

**RP:** In your view is the article processing charge the model for the future, or merely a transitional mechanism? If the latter, what do you expect to replace the APC?

**ME:** I can see futures in which there are residual APCs that cover the marginal costs associated with publishing, which I expect to asymptotically approach zero. I can also see a future in which the costs of publishing are not paid on a per paper basis, but rather are borne by a coalition of research funders, as is done with *eLife*.

**RP:** *Few if any of the commercial publishers introducing PLoS ONE clones seem inclined to offer fee waivers for researchers who cannot afford to pay a publishing charge. This, some argue, will impact on the PLoS ONE business model. As [Peter Suber](#) put it to me when I [interviewed](#) him last year, “If PLoS continues to grant fee waivers no-questions-asked, and if the new PLoS ONE clones don’t, then PLoS could see a steady rise in the number of indigent authors, subtracting any savings it might currently realize from the model. I don’t see a good solution to this problem, except to make the case that all fee-based OA journals, including the new clones, should offer fee waivers in cases of economic hardship. But I don’t expect that argument to carry much weight with publishers who want to maximize profits and minimize the financial stability of a rival.” Do you agree that there is a danger here?*

**ME:** First, let me state emphatically at the outset that we will always grant such waivers – the absence of funds to pay the cost of publishing will never prevent us from publishing someone’s paper.

And I don’t think the scenario you raise is a real concern. There are many reasons, but most importantly because the marginal cost of processing an article is going down, and will continue to do so, asymptotically approaching zero. Of course we’ll still need revenue to support our staff and infrastructure, but, so long as we have a healthy number of paying customers, we will be able to sustain a very large fraction of fee waivers.

**RP:** *What percentage of PLoS ONE papers are currently published at no charge?*

**ME:** It’s around 10%.

**RP:** *I wonder if fee waivers don’t create their own problems. You will perhaps have read the [interview](#) with [Padmanabhan Balaram](#), director of the Indian Institute of Science ([IISc](#)) in Bangalore. Amongst other things, he said, “As an Indian scientist, I do not want my government funds to be subsidizing Public Library of Science (PLoS) journals or any other non-Indian open access journal. Some journals waive these charges for authors from developing countries. But I do not think we should go begging for waivers. They do nothing to counter the ever-present danger that authors who cannot pay will be squeezed out.” How would respond to Professor Balaram’s concerns?*

**ME:** I read that as Dr. Balaram wanting to encourage the growth of the Indian publishing industry, which I fully support.

I understand his concern, that he doesn’t want to support the growth of an industry that is ultimately destined to shut him out. I can assure him that PLoS will never do that, but I respect his desire to ensure that Indian science is not at risk.

**RP:** *What is causing the marginal cost of processing an article to move towards zero, and why is it taking so long to get there?*

**ME:** It’s dropping because of increasing use of technology to convert manuscripts that come in from authors into publication-ready XML, HTML and PDFs. But the holy-grail – when the cost of the publication part of the process drops close to zero – is when we get publication ready content from authors. Such a system does already exist – we use it for *PLoS Currents*, for which we charge nothing to authors.



But not everyone's ready to use a fairly crude web-interface to construct their papers. We've been hearing for years that Microsoft are working on a plugin for Word that would allow authors to produce publication ready structured documents, but nothing tangible has come of it yet. There are several efforts to do this underway (c.f. the [Annotum](#) project).

**RP:** *How would you reply to someone who asked why, if the cost is falling, PLoS ONE has not lowered its prices to reflect that fall?*

**ME:** Our costs for PLoS ONE haven't dropped that much yet because every paper still requires manual attention. As we achieve more automation, our costs and charges to authors will drop accordingly.

**RP:** *You said earlier that the PLoS ONE system did not hit the mark in terms of providing functionality to allow post-publication commentary, and I suspect most people would agree with you on this. I do not think it is possible, for instance, to ask the PLoS ONE system to alert you if any subsequent comments are made on a paper that you have commented on. I have been told that PLoS has recruited someone specifically to address these issues. On the other hand, I get the feeling that PLoS may have concluded that it is pointless to expect many researchers to post comments on the PLoS site. Researchers seem to prefer commenting on papers on their own blogs, or on social networking sites like Twitter. I note you spoke of "capturing" comments. This is the same expression used by Mark Paterson when he [gave evidence](#) to the [UK House of Commons Science & Technology Select Committee](#) about post-publication peer review last year ("Our general approach to the question is to try to capture as much of the activity that happens after publication on to the articles themselves."). Has PLoS moved to a position where, rather than trying to persuade researchers to comment on the PLoS ONE site, it plans instead to develop tools to trawl the web for comments and bring them back to the PLoS ONE site?*

**ME:** No. We remain eager to create, or participate in the creation of, systems that would make it easy for readers to interact with the literature in a much more dynamic way. Harvesting things that happen on blogs, twitter, etc... is one way, but I still think there is a role for dedicated software that would help manage this interaction in all the ways you point to.

### Article-level metrics

**RP:** *I assume this is connected with PLoS' advocacy for article-level metrics. You noted earlier that PLoS ONE received a surprisingly high impact factor, but in fact as an organization you do not support the use of impact factors. Perhaps the model you envisage therefore is one in which PLoS ONE would combine what it captures from the web with data from its own site (comments, download rates etc.) – in order to provide an aggregated collection of data about an article. And some of your earlier comments would seem to imply that you would like to do this for every paper published, regardless of who published it. Is that correct?*

**ME:** Yes. I think it's a mistake to design any system that is PLoS specific. Not only because I do not ever place the interests of PLoS over the broader interests of science. But also because people will be far less likely to use a system that is publisher or journal specific. The whole point of what we're trying to do is to make the journal irrelevant, and I think this needs to be a first principle in everything we do.

**RP:** *Could it be that the real problem you face is that most papers will never generate much commentary, or even interest, partly because there are so many papers being published that many will not even be noticed, and partly because a lot of papers offer*

*very little that is new or commentworthy in any case? [Sir Martin Rees has estimated](#) that the average paper receives only about 0.6 readers.*

**ME:** I don't see that as a problem. Indeed, in a system in which anyone can read any paper without restriction, and there are robust mechanisms to ensure people find and/or alerted to papers of interest, the failure of a paper to attract readers and commentary is a very valuable piece of information.

**RP:** *Where does PLoS Currents fit into your picture of the future?*

**ME:** We want to give authors a wide range of options for publishing their work, and *PLoS Currents* is our experimental platform for placing more control in the hands of authors to enter their papers into an archival format directly, and for streamlining the process of assessing the validity of a work.

**RP:** *There was some discussion within the OA community at the end of last year about ["gratis" versus "libre" Open Access](#). This seems relevant to your vision of a more distributed corpus of research papers. The debate was sparked by a [paper](#) in *PLoS Biology* by [Michael Carroll](#). As I understand it, all PLoS papers are published using the Creative Commons CC-BY license, which is libre OA. As you pointed out, commercial publishers, by contrast, tend to prefer gratis OA. However, even OA advocates appear to differ on this issue: Carroll believes that only libre OA should be countenanced, [Stevan Harnad](#), argues that gratis OA is adequate, and that many researchers do not want their papers to be made libre. PLoS presumably agrees with Carroll on this, but what are your personal views on the matter?*

**ME:** I'm completely with Carroll on this. I understand Stevan's point – and I applaud everything he and others have done to promote self-archiving and other related gratis OA ventures – but he's framing the discussion as being a choice between no access and gratis access, in which case gratis OA would obviously be better.

However, this is a false dichotomy. We don't have to choose between no access and gratis access. As PLoS and other gold OA publishers have shown, we can have libre OA and have a financially stable and thriving publishing industry.

And I don't see any benefit of gratis OA over libre OA. I've heard people raise the issue that authors don't want to enable redistribution, reuse, etc... – but I rarely hear that from authors, and when I do, it's a very fragile opinion born mostly of not having thought about it carefully.

The only possible argument is a tactical one – Stevan has argued, for example, that pursuing libre OA somehow distracts from the pursuit of gratis OA. He is, of course, right in the abstract, that there's no practical impediment to every author all of a sudden putting all of their papers online in archives or whatever. This would achieve universal OA – but only for an instant – because the moment it starts to actually become possible to find any paper you want for free in an archive, there's no reason to subscribe to journals any more. And the journals know this.

So if self-archiving ever started to gain real traction, the green light publishers have given to do it will immediately be withdrawn. It's possible that, in the meantime, it would have destabilized the industry in some significant way, leading to its collapse. This would be good, but I doubt it will happen – the publishers aren't that dumb.

However, even if it did, we'd still need an alternative – so it's always been our view that we should just skip this unstable middle stage and try to build a stable system built the way we think scientific publishing should work.

**RP:** In the [blog post](#) I cited earlier you described the future of scholarly communication as you would like to see it. This assumes that when a researcher submits a paper the reviewers are asked to assess both technical validity and importance, but as two separate tasks. This sounds new to me. When I [spoke to](#) the then managing editor of PLoS ONE Chris Surridge in 2006, for instance, he said, “We believe that the more subjective questions about how a paper relates to other work, and where it fits into the whole corpus of scientific literature are still important questions. But we feel that these can be better answered via an open peer review process that takes place after the paper has been published.” In your blog post you envisage the likely impact of a paper being encoded “at the time of publication”, which sounds more like PLoS Biology than PLoS ONE. Is this a new vision of the future, one that has also been developed as a result of the failure of PLoS ONE to catalize post-publication review?

**ME:** It’s not new, and I am definitely not advocating fixing anything at the time of publication. My point is that when reviewers assess a paper for technical validity, they are inevitably also assessing its significance. I would like to capture this assessment and share it with readers. I would also like to capture similar assessments from anyone who ever reads the paper.

**RP:** You also say that this new model would replace the existing system of journal titles “with a structured classification of research areas and levels of interest” and so undermine the “winner takes all” attitude in today’s journal hierarchy. Can you expand on how exactly that would work and how we would get from here to there? I assume that those publishers who own the titles at the top of the journal hierarchy would resist such a development.

**ME:** It’s very simple. From the perspective of the research community, a “Nature” paper has nothing to do with the publisher or the ISSN of the journal in which it was published – it is simply the judgment of three or four reviewers that that paper is likely to be very important and will appeal to a general audience. Likewise a “Development” paper is one that is of high import to developmental biologists.

Today we choose to encode this judgment in a journal title. But we could easily encode it in a simple structured way that captures the reviewers’ judgment of how important the paper is and who it might interest.

So, for example, a *Nature* paper might get a 10 on likely impact, an “all biologists” in audience and a five on probability of being correct, while a [Development](#) paper would get a 6 on likely impact, an “all developmental biologists” on audience and a 9 on probability of being correct.

**RP:** A [paper](#) published in PLoS ONE last year reported that Gold OA still only accounts for 8.5% of scientific publications. This compares to nearly 12% of papers available as Green OA. [Others have estimated](#) that the total figure for OA in 2011 is around 30%, two thirds of which is Green OA and one-third Gold OA. However, I think your point is that although self-archiving may theoretically be able to achieve universal OA, and likely more quickly than Gold, in practice the moment that it was viewed as a serious threat it would be stopped in its tracks by subscription publishers withdrawing permission for researchers to self-archive their papers. And if they did not do that, it would trigger a collapse in the publishing system?

**ME:** Yes. Though I want to be clear that I would welcome a collapse of the closed access publishing system. I just don’t think the publishers would let it get that far.

## Public Access Policy

**RP:** *Would I be right to conclude from this that you believe advocates of Green OA would be better advised to put their efforts into Gold rather than Green OA?*

**ME:** I don't think it's either-or. I believe we have to develop Gold OA, but I also have pushed for Green OA efforts like the NIH's Public Access Policy.

**RP:** *Indeed, and the NIH Public Access Policy has come under renewed attack recently, with the proposed Research Works Act ([RWA](#)). What is your take on the background to this, and what do you think publishers realistically hope to achieve?*

**ME:** It's pretty obvious that the RWA was introduced at the behest of – and appears to have been largely written by – Elsevier. I think they're used to having their own way, have cultivated relationships with members of Congress, and got someone to introduce a very poorly thought-out bill that places Elsevier's corporate interests ahead of the public interest.

It's pretty clear what Elsevier hopes to achieve – killing any step towards open access, which they view as a threat to their profit margins. It's interesting that most other big scientific publishers stepped forward to condemn the RWA after it started to get a lot of bad press.

I'm not sure if they are just trying to kick Elsevier while they're down, or if they have really made their peace with public access, but the net effect of the RWA was to galvanize support for the NIH's Public Access Policy.

**RP:** *How do you see it playing out?*

**ME:** think the RWA is dead on arrival. There's more support for the counter-bill – the [FRPAA](#) [Federal Research Public Access Act] – but it will be hard to pass it during an election year.

However, government public access policies are likely to increase in number over the coming years, especially because of the [America COMPETES act](#), which has provisions calling for broader public access to government-funded research.

**RP:** *You have been particularly critical of Elsevier's role in the introduction of the RWA, and have drawn attention to the fact that senior executives at the publisher have donated money to the two co-sponsors of the bill (Representatives [Darrell Issa](#) and [Carolyn B. Maloney](#)), and you have suggested (or implied) that the text in a letter sent out by Rep. Maloney was written by Elsevier. Do you see Elsevier's behaviour as being especially egregious in attacking the NIH Policy (after all, other publishers surely support the bill)?*

**ME:** I have long argued that it makes no sense to single out Elsevier, when many other commercial and non-profit publishers have equally bad open access records.

However, in this case Elsevier really are singularly at fault. Their fingerprints are all over this bill, and they've clearly been behind the PR push, and have made a host of ridiculous statements in support of the bill.

So Elsevier deserve all the opprobrium they've gotten on this one.

**RP:** *Do you have any view on when we can expect to see universal OA, or even whether we will?*

**ME:** I don't like predicting things. I am confident that we will achieve universal OA, but when we achieve it depends on so many other peoples' decisions and actions that it would be silly to try and predict when it will happen.

*RP: Finally, what developments can we expect to see in 2012, both with regard to PLoS ONE and to PLoS more generally?*

*ME: A big push to reduce the time from acceptance to publication for PLoS ONE, and a renewed emphasis on PLoS Currents as a way for scientists to rapidly communicate their work to their colleagues.*

*RP: Thank you for your time.*

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