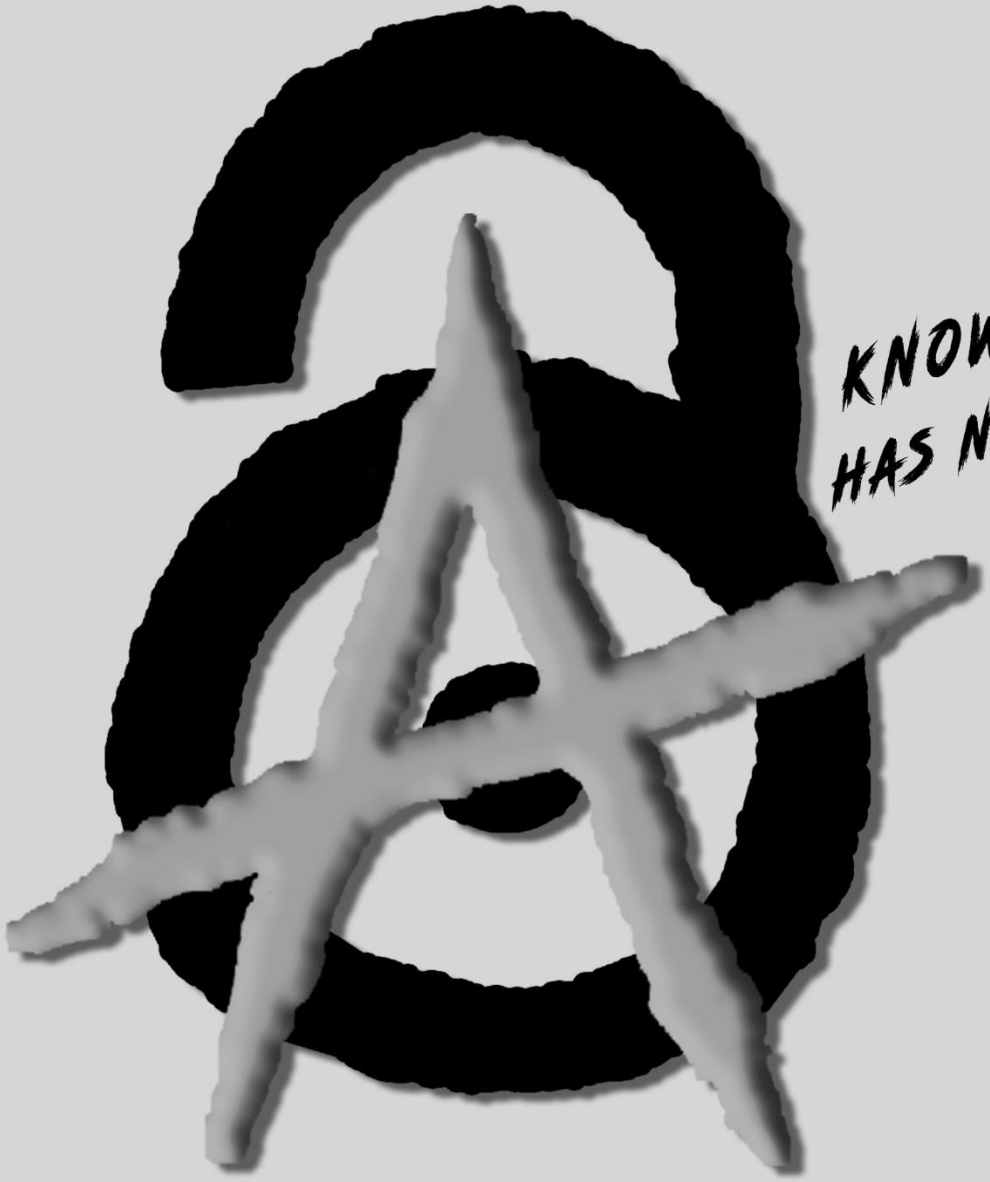
THE REVOLUTION OF OPEN SCIENCE



KNOWLEDGE HAS NO MASTER

BY JONATHAN TENNANT

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Introduction

This book is an evolutionary anthology all of the texts I have written or contributed to in a significant way over the last 9 years on the topic of 'Open Science'. They are presented in approximate chronological order to show the 'progress' of my thinking through time, and also the flow of the discussions around the various threads of Open Science. Hopefully, this text will be a useful reference source for many of the ongoing and future developments in Open Science, which seems to represent a critical point of transformation in the [r]evolution of global higher education systems.

My early curiosity for Open Science began around 2011, and grew from an initial keen interest in public engagement with science, as well as through working in science policy in the UK with the Geological Society of London. The exact moment my eyes were opened was when I learned about the profound reality about how most scientific knowledge we have ever produced as a global society remains inaccessible to those it is supposed to serve (i.e., you), and that the scholarly publishing sector is designed precisely to make money of this unethical and bizarre knowledge apartheid. The more I learned, the crazier it got: some publishers making obscene 35% profit margins off the work of academics, numbers that make even the biggest oil companies wince; the careers of researchers and the distribution of 100s of billions of dollars of taxpayers' funds being dictated by administrators who care more about lazy bean-counting methods of evaluation rather than anything to do with intrinsic quality or merit; researchers who are forced to commit all sorts of questionable methodological practices to massage their work into positive narratives, and donate their work to ruthlessly exploitative commercial journals in exchange for the possible glory associated with their illustrious brands. As soon as I learned about the innumerable injustices embedded in our scientific knowledge production system, I knew I had to be part of challenging them.

My writing about it started very early on, around 2012, so before my PhD had even started. Most of this was pretty casual to begin with, relating to how I wanted to be more public-facing with my research and really expose the human elements behind the process. As a palaeontologist, when people ask what I write about, I usually shrugged and responded "I dunno, fossils n shit", hence the dignified name for my website and main blog. Over the years, this blog documents a reasonably transparent history of my research in real time, and my thinking about how to more effectively communicate it. I did this as a way to hold myself accountable to 'open research practices' (i.e., ones that made sense to me), making sure that all of the methods and discoveries were as publicly accessible as possible, including for non-palaeontologist audiences. That was the 'fossils' part, at least.

Which brings us on to 'and shit'. As anyone who has ever suffered the joys of learning the English language, 'shit' can mean just about anything depending on the context. In this case, it means pretty much everything besides fossils. Which, over the years, began to focus more

and more on developments in Open Science as it became more mainstream. My early interest in the interface between 'the public' and science, as a communicator and policy wonk, solidified during my PhD at Imperial College London due to the significant developments in Open Access at the time in the UK. Open Access is this shocking idea that those who fund our scientific research, which includes you, dear taxpayer, should have the right to access the results of it without additional payment; something eminently feasible given readily available modern Web technologies. For the last 5-10 years at least, Open Access has dominated the discourse within Open Science, developing from initial coffee-break small talk to now international policy discussions.

London was a hub of debate during the 2010s, with an endless stream of talks, debates, workshops, and conferences on 'open scholarly communication'. Through time, I became increasingly engaged informally in a sort of 'activist' manner as part of a strong local community. Probably just because I tend to be brutally honest about things and speak my mind, and there are obviously a lot of problems our research culture faces. Early on, several prominent voices in UK palaeontology made a number of direct and aggressive threats to me, my work, and my career because of this, attempting to censor my voice in this space. Strangely, this disheartening lapse only ultimately renewed my belief that, both ideologically and pragmatically, Open Science in its various forms made total sense and was something worth vigorously supporting. Many brilliant others also took this position over the years, and the fruits of our labours began to show in the increasing awareness and uptake of open research practices around the world, even reaching the highest policy levels of the United Nations.

Towards the end of my PhD, after losing taste for much of the UK palaeontology academic community, I moved to Berlin, helping to found the Berlin Open Science Community. Here, I found much more of an equivalent 'activist' spirit, and less apathy and elitism than I had found in the UK research culture. Berlin was an incredible community hub for all sorts of hackers, technologists, and researchers to come together in a brilliant melting pot to advance Open Science. I was fortunate enough here to land a job at the tech start-up ScienceOpen, where I was able to learn more about the technical and publishing sides of scholarly communication. These combined experiences gave me a fairly decent breadth of understanding of the various and complex elements and viewpoints involved in debates around scholarly communication. I still very much consider myself to be 'learning on the job' when it comes to Open Science, and enjoy learning from the different perspectives that people and organisations have, especially when they challenge the views that I have. You can read more about my weird journey into Open Science in this interview with Asger Larsen for Revy, if you wish.

At the present, I am writing this book while on a period of leave, having just finished short-term research fellowships in France and Denmark. I am using much of my time to reflect on the last few years of my life, how I got to where I am now, and how to use this more effectively to advance Open Science in the future. This introspection was what prompted me to compile

this book, which I consider to be a useful milestone in my developing understanding of Open Science and its role within wider cultural change. It is a truly fascinating exercise, to see how your personal style, language, and understanding of concepts dynamically changes through time, much like keeping a journal. Being able to spot mistakes, patterns, predictions that came true, things that are still being hotly debated, all encoded in a record, is a powerful way to take stock on what the best strategy for the future is. I remain deeply optimistic for a healthier, fairer, and progressive egalitarian research culture.

Many of these articles were co-written with others, some for specific websites, and others for my own personal website. All are freely available at their source or openly licensed for re-use in this manner. Others were written for specific organisations I worked for at different times, including paleorXiv, the Open Science MOOC, and ScienceOpen. I have not included posts that seem to heavily focused on one product or company, and have removed a lot of images that were not relevant or for copyright reasons. For some time, my personal blog was also hosted by the European Geoscience Union, and I was also a blogger for Nature. Some of the articles here have received a light copy-editing just to make the format consistent, but the content all remains the same as at the original published source.

This book is dedicated to all of the 'Open Heroes' out there who have dedicated their work to public rather than person gain, and who act with honour, compassion, and love. You are a constant source of support and inspiration for me. Any funds raised from the sale of this book will be reinvested in all future non-profit Open Science projects that I am involved in. Enjoy!

2012

The day I was allowed into Parliament.

Yesterday, this intern was fortunate enough to attend a Parliamentary Committee meeting on Higher Education Reforms, with the Rt Hon (innit) David Willetts MP. Most people reading this will probably recognise him as the current champion for pushing open access in Government policy with the Finch Committee, so seeing him in the flesh was a starry-eyed moment for me. The proceedings were concerned with the White Paper on Higher Education Reform, published November 2011, and the subsequent consultation responses (dispatched on April 5, 2012). As the Geological Society have an input into geoscientific education in the UK, I attended to see if any of the issues we had addressed were raised.

The Welcome Hall, after you've evaded the Velociraptors.

In the Committee meeting room, Willetts was placed in the centre of a pack of political sharks, who looked like they about to rip into a helpless fish. Willetts was promptly grilled, provoked, and otherwise casually insulted by members of the Committee for the next 90 minutes, in a terrifying display of political acumen. This deliberately challenging nature of the Committee is not the norm, according to several of the other spectators present. Throughout the talk, the one thing that struck me was Willetts' passion – you could tell he genuinely believed in

his proposals, and was happy not just to defend them, but accept progressive criticisms on any weaknesses.

The reason for the seemingly scornful display by the Committee was that they believed Willetts and the BIS Council to be "playing games" with the Committee, with Brian Binley (Tory) even going as far as to suggest that Willetts could be held in contempt of Parliament! The reason for this was that BIS only released their response to the consultations of the White Paper the day before the meeting, thus giving the Committee no time to analyse the latest proposed regulations. Obviously, this publication is pretty poor timing, and Willetts reasons for the delay were largely unsatisfactory to the Committee; he cited the Queen's Speech as a reason for deferral, which was some 4 weeks earlier. Unfortunately, this prompted a series of queries into the timeline of the project, instead of the content of the document being adequately discussed. It was difficult to tell if Willetts was exasperated about these questions, based purely on misunderstanding and lack of communication between the two parties, or if he was being evasive with his consistently reiterative answers.

One of the major points raised by the Committee was the proposal by BIS to move forward without primary legislative backing and without any actual data, which firstly does not provide transparency or Parliamentary input to proceedings, and secondly confounds students who are forced to make quite substantial financial and career decision based on uncertain futures regarding, for example, student loan repayments. There is no existing data regarding the new student fees system, which means that students have to actually commit to the scheme to create the data that they need to make a fully-informed decision, a somewhat counter-intuitive progression. Willetts' responded to these issues in that he would be using existing legislation as a foundation, with the genesis of new legislation as and when was needed. This was unsatisfactory, as it provided no timeline, and implies a 'play-it-by-ear' approach to what, for students at least, is a quite substantive issue. With respect to the student fees repayment system, Willetts assured the Committee that no future financial issues would impact in any significant way.

This lack of data and inadequate timeline were both recurrent throughout the subsequent questions. For multiple policies this meant that although the proposals seemed excellent on the outside (from an academic's point of view), internally they were based on a weak empirical foundation, with little decision made on the future evolution of the initiative. This issue was hammered home when the Chair outlined the numerous consultations still required for the initiative to function, which had not yet either been initiated or were still in progress. Bailey concluded the session, rather worryingly, stating that the necessary information was not available for students at the time of them choosing their university and future. This circumstance appears to have been brought around by a lack of data and formal assertion of a rigorous timeline. The specific details of the document were postponed for scrutiny based on the late publication of the aforementioned response document.

Later that same day, I was fortunate to attend a less-formal seminar by Willetts at Imperial College London (ICL), under the banner “Higher Education and Science”. This event was watched over by what Willetts referred to as the “Science Mafia”, the seven heads of the UK research councils, and with a prolific line-up of staff and alumni in the audience.

Willetts in the Skempton Building at ICL.

Willetts was keen to use numerous case studies from ICL during the talk, which largely revolved around how science was being integrated into Governmental procedures, and gave slight insight into how Ministers operate. It was unclear, however, if this meant Willetts was simply well-informed about projects at ICL, or playing to his crowd, or a combination of both. Nonetheless, his passion for progressive higher education within the UK shone even stronger than during the Committee meeting, when he outlined his desire to develop universities into ‘Humboldtian institutions and economic powerhouses’. The core of this revolves around the ongoing, and public, financial debate, which Willetts was keen to highlight the need for more rigorous evidence-based policy (can’t think why he brought this up). He gave a beautiful analogy to potential pathways to implementing his policy, based on art. With the ‘Cezanne approach’, policy would be implemented incrementally (an initiative highlighted earlier as being counter to the Committee’s recommendations, and mis-quoted by Willetts), but with the ‘Picasso approach’, an explosive ‘break-the-mould’ mode of implementation would be applied, conforming to the recommendations of the BIS Select Committee. Either way, Willetts drove home the point that the higher education (and specifically that for Postgraduates) required careful monitoring in the future.

It was a heart-felt talk, with some truly awful questions at the end (one member of the audience was clocked at about 5 minutes just asking her question), and one of which seemed to strengthen Willetts profile within the ICL community. I got to shake his hand at the end, and commend him for his championing of open access in the UK, so all in all, a good day.

Politics is odd.

Relocation, and a chance to try some open science-ing.

Shortly, this blog will be moving to a new home within the European Geosciences Union blog network! Somehow, they get the idea that a blog with the URL 'fossilsandshit' would be appropriate for their needs. Anyway, as part of this, the blog needs to become more focussed. That means no more miscellaneous rants, no more diversions on to drugs policy, and much to my dismay, no more swearing*. Bollocks. What it does mean, is loads more Palaeontology! Possibly with some ranting (according to my tags, this is what y'all like the most anyway? How cynical.)

As such, it seems like a perfect opportunity to try something I've been thinking about for a while. I'm sure many have done it before, or at least had the idea, but screw it I'm doing it anyway. In about a month, I'm starting a PhD in London! I'll be investigating the Jurassic-Cretaceous boundary to see if there's a 'hidden' mass extinction in terrestrial organisms, as well as looking in detail at some groups such as atoposaurid crocodylomorphs. This is to feed into a much larger ongoing project to reconstruct the patterns and processes of vertebrate biodiversity from their origins on land to now. Neat eh!

So, with this in mind, and the impending relocation (although I'm not 100% clear on the details yet), I figured I'd try and sort of live-blog my PhD, from day 1 to day 1000, or however long it's going to take. The idea is to open up the PhD process, by going into what exactly a vertebrate palaeontologist does nowadays, as well as the more general aspects of PhD life. This means going into the details of the processes, not just 'hey look I didz a graph', but 'here's how you can replicate this analysis 100% if you wanted, and here's why it's awesome/I'm doing it'. I'm still expecting this PhD to be an awesome ride, as opposed to some of the more negative stories floating around the interwebz recently, and hopefully will be able to convey this and show that doing a PhD is something pretty damn awesome still. Of course, it could be shit, and you might just read weekly posts of "added some data, computer died, beat up undergrad, ate soup made from cold water and ketchup", and the like, but hopefully it'll be a bit more of a dynamic insight than these delights.

Rationale: If I'm doing something I love, why wouldn't I want to write about it, and if it's something I think is awesome, why wouldn't I wouldn't to tell everyone else about it?? I wouldn't be doing a PhD otherwise. Also, my memory is pretty naff, so it'll be nice to have a record of the experience.

Some of you are probably thinking, 'but if you open up your PhD, won't you just get scooped on the idea you're investigating?' This thought has crossed my mind, but frankly, I'm not going to be doing anything that isn't theoretically beyond anyone else's reach anyway, as the data is all openly available, as is much of the software I'll be using too. Naturally, I might have to keep some of the conclusions slightly secret, until I publish them in an open access journal anyway. Every publication I'm first author on in future is going to be fully available, as far as it's possible for me to make in terms of content and data. Taxes paid by you all are allowing me to conduct this research, so I'll be damned if a single aspect of it will be paid for again.

I'll post weekly updates on here, and using Twitter under the #OpenPhD hash tag, when the time comes. What I hope this will achieve is some sort of dialogue were people can see not just the end result of research, but query the processes, and gain some understanding of the scientific process at the same time. And of course, opening up the discussion means that I might be able to crowd-source some valuable points of view from you great peeps!

Stand back, I'm about to try a science.

*A separate outlet may have to be found for this, if (=when) needed

Why bother communicating?

Every breed of scientist is coming under increasing pressure and encouragement to communicate their research and knowledge to the wider public. For each discipline, sub-discipline, and not-quite-a-discipline, there are differences in the way science needs to be, and should be communicated, depending on the appeal of the subject, and the target audience(s). A recent paper by Iain Stewart (from TV, and a professor of some sort – he even has his own Wikipedia page!) and Ted Nield (sci-comm jedi, and editor of Geoscientist magazine), set out to explore how geoscientists can effectively communicate and engage the wider public with their science. How do we get people from taxi drivers, ice-cream men, the barrister at Starbucks, you, and every other person out there interested in geoscience, assuming of course that they want to (which, as you'll see, a surprising many don't)? Their study is pretty wizard, but unfortunately it's stuck behind a paywall, which means fewer people will be aware of what I reckon is a pretty important study for geologists to get hold of, and equip themselves with (Note: I have spoken to Iain about this, and he'll hopefully be making a copy available somewhere!) So, I just kinda wanted to summarise the key issues and points raised, as well as the suggestions made to overcome engagement obstacles to help make geologists more effective science communicators.

The point that they wish to get across is simple: geologists, stop telling people 'geo-facts', and start communicating the deeper 'geo-culture'; focus on using Earth's history to tell a story, provide a narrative, a context. For example, don't tell someone 'this is granite formed

underground from lava'. Tell them something like 'deep chambers underground hold vast amounts of magma, molten rock, deep from within the Earth. When it cools down over millions of years, you get this: a rock." I dunno, just an example from like, 5 seconds of thinking. Imagine how well you could tell a geo-story with a little bit of imagination!

A question that comes across a lot of the time to myself and others (scientists, co-workers) is 'why bother?' My response to this is usually simple, something along the lines of 'cos fossils freakin' rule!'; but what about for other geoscientific disciplines? Do people want to know about polycyclic aromatic hydrocarbon as much as a *T. rex* ripping a Triceratops' head off? (if you do, seek help.) On a positive note, there are many brilliant geoscience blogs out there, covering numerous and broad topics. But these still pale in comparison to what is truly out there, the cutting-edge research going on around the globe, that frankly, if people were enjoying, why the *expletive deleted* wouldn't they be talking about it? That probably refers to a few people reading this, and if so, what's your excuse?

Iain and Ted address this question/predicament quite thoroughly. It begins by unravelling motives. Do current geoscience communicators (whatever that actually means) do it to help inform and shape discussions about key science issues (note that geology is quite central to issues such as climate change, biodiversity, fracking, energy, theology, water use, sea-level changes, oil production, you name it), or for personal or organisational enhancement? Why do **you** 'communicate science? (be it via blogging, twitter, outreach events etc. – answers below!)

Often a response to why scientists don't communicate is that it takes away from that oh-so-precious research time (I'm writing this at 9pm at university, after working all day from 9am). This doesn't have to be the case, and I'd quite comfortably say that, in the long term, the rewards are better than losing an hour a week to keep the world updated with your research. In fact, it has been found in several studies that scientists who actively engage more with the public tend to have a higher publication account, and higher academic rank and leadership positions. Lack of time can no longer be a valid reason for failure to engage.

What about culture. Jane Robb has written a most spectacular post over at her Geoheritage Science blog covering this (see previous posts too), and writes about it in a fashion far more eloquently than I ever could. So, check it out! Needless to say, there are some within the scientific community who will never see the values of communication outside of science, or will simply find the technical details too much to understand, or even beyond their comfort zones. Thankfully, it appears these are a small minority according to a 2006 report by the Royal Society. (6-10%)

What about communicating to the political spheres. I ran through some current topics where geoscience has a role or influence just above. Many of these are policy-based issues (e.g., fracking), and require substantial information support from geoscientists for rigorous

discussion and policy development (among other branches of evidence). This is a whole other series of blog posts though, but something to consider if you're a scientist reading this: how can **you** engage policymakers with current key geoscience-relevant issues?

I won't touch on the whole media/journalism aspect, as this is way beyond me, and something I'm yet to experience personally. Let it be said though, that according to this article, it appears there is a deep mistrust between geoscientists and journalists, through fear of 'spin', misquotation, and unpredictability.

A final reason of why to communicate is the position that scientists hold in the public eye. Studies have shown (e.g., by BIS), that scientists actually have a relatively high level of public trust from the public and media (in the UK, anyway). Get in! This comes with a degree of responsibility. If you have trust, use it, or someone else will abuse it. Journalists will never understand a scientist's research as much as the scientists themselves, so that level of understanding may be conveyed, or worse, mis-communicated.

Virtual Palaeontology – taking science communication to the next level.

I recently wrote a small series about how geoscientists can become more effective communicators of scientific knowledge to the general public, and the pitfalls and issues associated with this. The overall strategy revolved around using the right type of language, along with a context and narrative to create relevant stories, but above all this, to just go out there and do it! That's exactly what Imran Rahman has done, except he's gone a huge step further taken palaeontology and science communication into the digital age!

In a new paper, Imran, along with two others, demonstrates the value of using 'virtual fossils' as a tool for science communication, I guess specifically to palaeontology, but there's no reason why other fields cannot adopt (or already have done) similar methods. The use of digital palaeontology has been ongoing for quite a while now within the scientific community, with virtual reconstructions ranging from hadrosaur skulls using CT-scanning (computed tomography – the same process they use to peer inside you in hospitals) to early molluscs and arthropods using a process known as serial grinding. As such, it is pervasive throughout palaeontology, but has never really taken flight and been introduced to the public as an engagement resource.

Imran wasn't content though just with digitally communicating any old fossils – virtual reconstruction can breathe life into rare and fragile specimens, and allow people to interact with them in ways previously unknown. Digital reconstructions provide accurate 3-dimensional representations of fossils, and you can fiddle with them in any manner of ways, including 'peeling away the layers' to look at their internal morphology. Pretty freaky. There's

actually some free software for playing with fossils like this, which I kinda have to plug as my supervisor, Mark Sutton, was the one who developed it.

Digitally reconstructed *Plateosaurus*, by Heinrich Mallison.

Taking it a further step, with the onset of 3D printing it is now possible to take this digital reconstructions and create synthetic and highly-detailed models that can provide great physical displays, for example in museums, along with digital reconstructions and perhaps the original fossils if possible – how cool would that be?! It would allow communities to interact with rare or fragile specimens in a new and unique way (and everyone knows the only reason people go to museums is for the fossils, right? Right??). Imagine the effect this can have for blind or visually impaired people too.

Imran pilot tested the application of virtual palaeontology earlier this year at the famous Lapworth Museum of Geology in Birmingham (UK), and established several criteria that would motivate project success:

- Fossils selected to exhibit would have to be 3D originally. This is for the purposes of CT-scanning and subsequent printing of the models.
- Fossils have to be finely-detailed, to be able to convey the important and previously hidden anatomical structures.
- The fossils must be appropriate for CT-scanning, with respect to size and relative density.

Imran and his exhibit at the Lapworth Museum (copyright: Imran Rahman).

During the exhibition, as part the University Community Day in June, Imran (along with Russell Garwood, another virtual palaeontology wizard) set up shop with a computer reconstructions on a laptop, a series of 3D models, projections of 3D red-green anaglyph stereos onto a screen (with 3D glasses to visualise properly). Throughout the exhibition, Imran and Russell were visited primarily by parents with young children; the former being more interested in the technologies, and the latter more interested in the model fossils and the 3D glasses, meaning that the duo had to take a two-pronged approach to successfully engage. As such, digital fossils provide a 'free-choice' learning opportunity for the general public, and can substantially enhance understanding of complex issues such as evolution and the nature and role of the fossil record. As well as this, they can provide a practical demonstration of how palaeontology isn't so much about the typical Alan Grant or Ross Geller scenario, but is instead advancing rapidly in parallel and conjunction with external technological developments. Huge kudos to Imran and the others for embracing this, and taking digital science out of the lab and to the public. More in the future please! Just noticed as well, Imran has been awesome enough to put the paper up on his academia.edu webpage, so you can read about this for free!

The British Geological Survey, partnered with several organisations, is currently creating an online catalogue of British type specimens (the specimens upon which taxonomic names are created upon). The rationale behind this project is to increase the global availability of specimens for study, as well as to have a record of specimens which may, unfortunately, deteriorate in quality over time. This is a pretty huge project, and the wealth of data being made available (I think openly for anyone too) is invaluable. There have already been hints that the database may be made available as an open education resource (which you can

contribute to if you wish!), but with this advance from Imran *et al*, the potential for it to be used as a vast science communication resource is undoubtedly a pathway that should be considered. Hint to anyone from the BGS reading this.

2013

Why and how Master's students should publish their research.

In the UK, many if not most Master's students do not publish their postgraduate research. I've been informed by several people that in US-based institutions, Master's students are continuously encouraged to publish their material by their supervisors and institutions.

Two years ago, I undertook an MSc at the Natural History Museum in London. One of the requirements, as with most postgraduate courses, was to undertake a research-based thesis. Out of the 21 students, so far only a single person (Roland Sookias) has had their research published. I have been informed that from at least the previous two years, this is pretty much the normal rate of publication! In fact, during the entire year I studied there, not a single supervisor/lecturer even mentioned formal publication or how to even approach manuscript preparation. This is an essential skill that all students should be taught really, and at least in my academic experience has been mysteriously neglected, by both students and their respective supervisors and lecturers it seems. This is especially the case, I feel, for Master's students who wish to progress in academia, particularly through PhD research. Papers are academic currency, and the sooner you start accumulating wealth, the better.

Publication of Master's research, anecdotally, seems more often to be the exception and not the rule. When it comes down to it, there are 5 options really that students have with respect to publication:

1. They simply choose not to;
2. Their work is not sufficient for publication;
3. They attempted to publish, and failed (rejected after submission);
4. They published formally in a peer-reviewed journal; or
5. They can make the manuscript and data available through other methods.

I'm currently re-writing my own thesis (second Master's) into a manuscript that is acceptable for publication, with guidance from my supervisor, Norm MacLeod. Admittedly, at the time of submission, the research was probably somewhere around option 2 – I've since done some additional analyses and found some cool stuff. This should be submitted to PLoS One shortly.

This has taken some extra time, alongside my PhD, but to get a peer-reviewed publication out of it, it's worth doing I think as an early career researcher (and I'm sure many others would agree).

The NHM in London is a world-class research institution, and *all* research conducted here should be published in some form, regardless of the academic level of the person conducting it. To shrug off this responsibility is detrimental to science. This is especially so if destructive processes are involved (e.g., DNA extraction and sequencing in invertebrates), as this research can never be replicated again.

There are alternatives to peer-reviewed publication. For this process, you have to go through many steps such as manuscript reformatting, peer review and possible rejection. Instead of this long-winded, and often extremely time-consuming process, you can submit your data and thesis, as it is, to open online archives. The only time this takes is that required to make an account (free), and upload the research, in raw formats (in most cases). For example, I recently uploaded my first Master's thesis, and accompanying data to Figshare, and the manuscript again to ArXiv to increase the visibility of the research. Since uploading to Figshare, both items have had over 600 views together, which is substantially more than it would have sitting on my hard-drive as a pdf, and I'm not sure about arXiv as they don't have any metrics like that. This has made the research open and available, and if someone wants to use it, they can freely, with the one caveat that they'll have to review the value and quality of it. Any scientist who think this is a negative step under-values themselves and the role of peer-review.

For a PhD, it usually helps to have publication experience, the best opportunity of which is with your Master's thesis. On the other hand. if you're not planning on going into further education after course completion, why should you publish? Well, you don't have to follow the 'traditional route' – the above is a time-easy alternative, and is a sure way of making your research open and accessible. Supervisors can provide additional advice on this, I'm sure.

So, Master's-level research appears, to me, a severely under-tapped source of scientific research in the UK. This is not just in terms of results and conclusions drawn, but also the literature critiques that accompany them, potential new methodologies, and the original re-usable data. Publication promotes an individual's academic growth, and credibility as an author. I'd imagine that employers outside of academia would look upon this well too. Despite potentially being a difficult and time-consuming task, preparing and submitting a manuscript can be emotionally satisfying, and give a student a great sense of accomplishment and a confidence boost. If, however, you don't want to pursue this route, you still have a duty to make your research accessible, and now with tools like Figshare and arXiv, that take just minutes instead of weeks or months to publish with, there's really no excuse any more.

Wouldn't it be wonderful if the fruits of so much labour from young scientists was made free for people to read and use, instead of being archived into dusty institutional shelves.

The values of social media and blogging for academics.

At this year's European Geosciences Union General Meeting (Vienna), I've been asked to be on a panel discussion describing the ways in which I think using social media and blogging can enhance academic careers. Sometimes, talks of this kind can be very echo-chambery, and there are plenty of really cool guides already out there online. This was a chance though to actually directly target a group of academics who may not have any experience of these things though, so was an opportunity to mobilise a new wave of 'web 2.0'-active academics. Of course, I'm writing this in advance of the actual discussion, so it might be the case that only a few people turn up and live-blog the entire thing, in which case it might be viewed as a little preaching-to-the-convertedy.

Here's a rough transcript of what I said for my part of the discussion:

Right off the bat, I want to emphasise that using social media tools and writing blog posts are not for everyone. There is no 'magic bullet' pathway that is suddenly going to transform your career, and you won't become some sort of maestro overnight: this stuff takes time, energy, and thought to commit to effectively. Time is the largest caveat: scientists work ridiculously long hours already; I personally work every day from about 10am until 12-4am, unless I'm off at a networking or learning event in London (or a conference), or decide to actually have a social life outside of the academic sphere. Not everyone can or wants to work hours like these, they might have families or other things to commit their time to, and many may not want to add these things to their extensive lists of things to do. People who say that ALL scientists need to become better communicators by embracing social media and blogging are blind to the pressures that we already face in terms of time commitment, and must realise that there is currently no formal reward system in place for us to embrace these things. Additionally, each person's experience will be unique depending on their approach, so there is no general guide to success or even precisely what to do. It all depends on how much time you're prepared to commit to these things, and the networks into which you find yourself integrated.

So, in spite of these first initial points of concern, the aspects of your academic career that using social media and writing blog posts can open up *can* be incredibly beneficial on three levels: personally, career-wise, and field-wide. I'll address these sporadically below.

It seems to me, as a very early career researcher, that the realm of science and scholarly communication is changing. Scientists are beginning to embrace, to a degree, the use and value of social media, blogging, and public outreach and engagement as part of an adoption of a culture of scientific openness. In part, I think this can relate to the 'Brian Cox Effect', where, the broader public are becoming more interested in scientific advancements. I think

that this actually goes beyond just blogging and social media then; it's about the emergence of a new 'model' of scientist, where everything that we do is geared towards the question of 'how can we take the science beyond the science'. There are 5 main traits that I think identify this model:

1. Academics are both aware and active with respect to current policy issues (e.g., science funding, open access, relative discipline-related policies such as marine science in the UK);

2. Commitment to direct public outreach, through science events, public seminars, sceptics in the pub etc.;

3. Indirect science communication, such as blogging, social media use (e.g., Twitter), science podcasting, television appearances – mostly related to the advancements of web technologies;

4. Open science advocation – taking your science out of the lab, not just by publishing in open access journals and using open data platforms like Figshare, but making the knowledge and the methods of knowledge acquisition accessible through 'open notebook' style transparency;

5. All the time, thinking about reciprocal engagement that you can only get through this sort of transparency; what can your science and your field do beyond simply get published?

So, here are some examples of how I've used this social media, blogging, and an adoption of this model personally:

- The Science Online (SpotOn) conference last year, I was invited to co-host two sessions about how academics and policymakers can enhance their reciprocal engagement to improve the strength of science-informed policies;

- I co-run a podcast series called Palaeocast, which just hit the benchmark of 10,000 downloads in just 6 months. Palaeocast is all about removing barriers between scientists and the broader public (i.e., by bypassing the lexicon of science-speak in journals), and we've found is a great way of conveying palaeontological research;

- The many uses of Twitter:

    - As an amplification tool for research, blog articles, Palaeocast, other interesting items;

    - An incredibly up-to-date news reel;

    - Discussion and networking platform (indirectly and directly, through scitweetups) – I've actually got many good friends now who I met primarily through Twitter; and
    - As a mode of science communication, by opening up what scientists actually do, and demonstrating that they are willing to discuss their research more broadly and openly.

- Blogging has many uses too:
    - It opens up the process and outputs of my own, and others, scientific research;
    - It makes research more accessible, by communicating it in a more informative and jargon-free (not the same as 'dumbing down') manner than journal articles;
        - Have to be careful sometimes, as obviously blogs don't have the 'stamp of approval' that peer -reviewed articles have. That's why I think scientists make the best writers, as we know the field better, naturally, and are more adept at extracting and critiquing information within articles (it's our job to);
    - It helps to build your online footprint; and
    - You can get feedback on your research from scientists within the field, and those outside too (e.g., copy-editors).

Throughout all this, it's obvious that one medal certainly does not fit all. Everyone will have different experiences depending on what they've committed to, which networks they've developed, and who they've reached with their outputs. It's worth emphasising that adaptation and flexibility are key, as social media develop, as science progresses, and due to the natural variation of audiences. But you won't know what the benefits of all of these are unless you actually go out there and try it, and stick with it. I can't tell you how blogging, tweeting, or podcasting will enhance your career, your scientific development, or the outputs of your field of science – this is something you'll only be able to tell after giving it a shot and looking back on changes after some time.

This brings us on to the issue of 'impact' – how do you know that your efforts of transparency, openness, outreach and engagement have actually had an effect? On a personal level, this is easy to see – check your writing, and see how much it has changed in style over time. The transformation can be quite impressive sometimes! But in terms of broader impact, this is more difficult to measure. We're in the early stages of quantitative measurement of research outputs – we all know that impact factors are a poor method of personal assessment, but we have tools now like altmetrics and ImpactStory that show the broader dissemination of

research (blog posts, journal articles). But these still don't measure 'true impact' – research impact isn't citation counts, number of tweets, being picked up by a research outlet, it's not even about being published in Nature; it's about the things you can't always measure. Comments and feedback you get, such as about initiating a societal or cultural change, or personal development or thought, are what really matters. You won't always know about this, and dissemination metrics can only ever give you an informed guess about the potential volume of impact. For example, someone mailing you to say thanks for writing about your PhD and that it's made them decide to pursue one now too after knowing a bit more about how they work, is worth more to me than a million blog post hits and no comments. It's for these anecdotal comments why I do what I do – even if you can't always put a number on things, it's nice to know that what you're doing is making a difference.

Now would probably be a good time to plug a recent article by a friend [the link to which is posted on Twitter, right abooout, now]. Jane Robb is a geologist and science communicator, and recently published a call for geologists to increase their public engagement activities, as a community. This occurs in two steps: firstly, within academia, in terms of wider education about the societal, cultural and economic implications of geoscientific research, which in turn would hopefully translate to more effective communication outside of academia, through the methods mentioned, and a broader appreciation and understanding of the effects of our research. This could help prevent issues influenced by the lack of understanding of our research, such as through the L'Aquila verdict where scientific evidence about earthquakes was effectively ignored and the concept of scientific uncertainty completely misconstrued, and more recently where Iain Duncan Smith made the ludicrous statement that geologists where of relatively less value than shelf-stackers, both of which point to a systemic communications issue between academia, and the end users of our research.

So, to summarise:

- Social media, blogging, etc., are all good for the discipline in terms of increased public understanding of what it is we do as a research community, and facilitates two-way communication between science, the general public, and policy spheres;
- Allows the general public to become reciprocally involved and engaged with the discipline (it is their money we're spending after all much of the time, so why shouldn't they get a say in how we progress?);
- Blogging is superb for improving your writing skills, and learning to write for different audiences (and getting invited to conferences in Vienna);
- Can help to inspire the next generation of scientists;
- It's a step towards embracing a culture of openness in science; and

- It increases your professional and public profile, naturally, which is great for job prospects, potential future collaborations, further promoting your research, and other opportunities.

That's about it. Should hopefully have been about 10 minutes! If there's more revealed during the discussion after this, I'll write it up in a new article, and of course, feedback on the content here is greatly appreciated!

From impact factors to impact craters.

Day 2 in the Big Brother house (aka the European Geosciences Union General Meeting). There's nowhere near enough beer, and tensions are getting high. A horde of angry horses have invaded the lower levels, and taken the President of Austria hostage, with demands of lowering the Fair Straw Tax.

But throughout all the acid-fuelled hysteria, two events have stuck out so far today. The first was a workshop discussion on open access publishing for early career researchers (ECRs), hosted by a new Editor for the EGU's publishing house, Copernicus. Unfortunately, this event confirmed a lot of the current issues with the development of open access policies globally, in that there has been a serious communications breakdown about the effects the policy transitions, particularly in the UK now that Research Councils UK's (RCUK) open access policy has come into play (April 1st), will have on how and where ECRs can publish. Here are comments on several of the more prevalent points raised:

The misconception that Gold-route open access publishing requires you to pay, up front, an Article Processing Charge (APC). Gold open access is immediate open access publishing, under an appropriate license (CC-BY, according to the RCUK) – of all global open access journals, the APC median and mode is zero. The commercial publishers, who don't have institutional backing, and largely out-dated models of publication, still charge exorbitant prices (up to $5000 in cases), as they are established names, with a track record of successful publishing. They also happen to operate many of the middle-tier ranked journals, based on impact factors (a journal-based metric that measures the average citations of the journal's articles over two years), which makes them attractive to scientists in terms of where to publish.

This is a prominent issue at the moment within academia. How do you avoid falling into the trap that journal title and impact factor mean anything about the quality of your research, and at the same time reach the audience who you want to (i.e., those in your field who read those journals)? My response to this is that if you can't reach the people who you want without having to submit to a particular journal, you're not trying hard enough and under-estimate alternative non-subject specific methods of dissemination. Conferences and direct emails are a great way of distributing your research to the right audiences, as well as hosting them on your department or research group or personal website. RSS feeds of non-subject

specific journals make discoverability a piece of cake nowadays. Using a combination of these methods, I don't see any reason why your research can't hit your intended audience.

With respect to impact factor as a mode of quality assessment on an individual basis, I'm just gonna leave this here. Along with this, it means that there's no longer any excuse to conform to relevant policies and publish open access. Dissemination of research has never been easier in this digital age, and we have to kick the impact factor habit (RCUK has explicitly stated that IF won't be used as an assessment metric). Alternatives such as ImpactStory and Altmetric are tools that are a step on the right path towards diving 'true impact' of research by providing more details about how the research has been picked up and distributed.

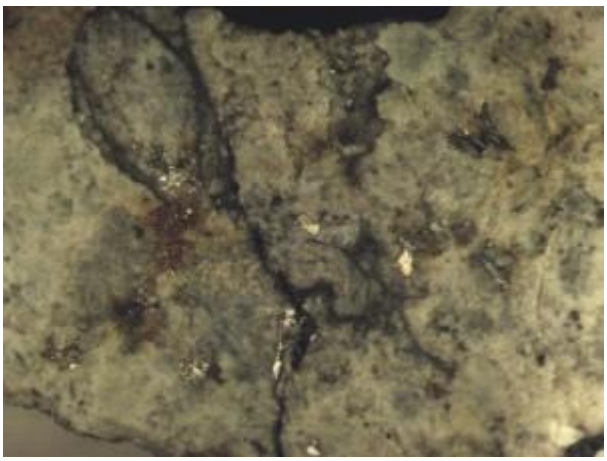
Other things to consider with respect to cost are models like PeerJ, a new initiative where you can have a personal and unlimited publishing account, with open peer review, for $299; BioMed Central, PLoS and others offer fee waivers for anyone who can't afford APCs (PLoS have never rejected a fee waiver, to my knowledge); developing countries have special circumstances recognised by many publishers that make research freely available to them anyway (see PNAS and Nature Publishing Group), and, er, a lot more stuff that I can go into more detail after the 'Demystifying Open Access' session on Thursday evening here, which I'll be part of as an ECR with knowledge of open access (caveat: I've never been published in a peer-reviewed journal, yet).

So yeah, lots of discussion about open access that indicates, to me, that people who are OA advocates, who work on the policy front-line, and those who are generally involved in the discussion must work harder to communicate the changes and issues with those who the policy changes will have the greatest impact on. So on from impacts of publishing to impacts of an entirely new kind!

In case you've been living in a hole for the last few weeks, a 10,000 tonne, 17m wide meteor slammed into Russia on February 15th, injuring more than 1000 people, and making a pretty loud bang, and spanking the Earth with the power of nearly 1000 Hiroshima bombs (about 400 kila-tonnes). On the same day, another meteor struck completely unrelated to this one at Chelyabinsk, but the difference being that it wasn't a surprise, caught on a video of the dashboard of some lucky driver, but had been monitored for over a year, giving somewhat more of a warning than a few seconds.

Bulk fragment of the Cherbarkul meteorite (Credit: C. Mayer / F. Jourdan; Western Australian Argon Isotope Facility, Curtin University).

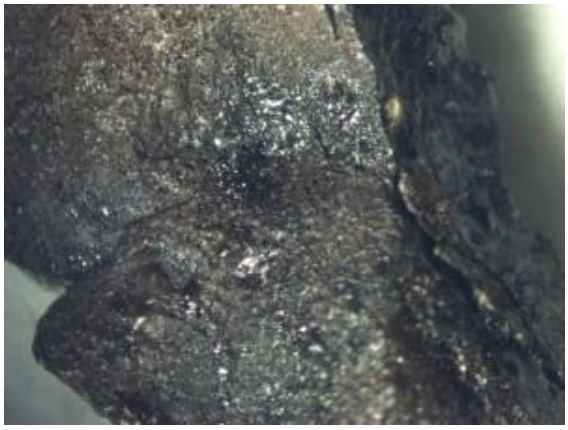
Known as the 'Russian Fireball', which also happens to have been Lenin's bedroom name, the geochemistry of this extra-terrestrial rock star has begun to be unravelled. Analysis of albite (one end-member mineral of plagioclase feldspar, which has a sodium-calcium solid solution) reveals to us the age and formation of the rock, as well as the impact history and secondary processes that occurred within the asteroid. Pretty neat eh, I guess chemistry does have its uses. Slightly cooler though, is what the science team had been doing to develop their understanding of how impact craters develop, by creating experimental impact craters in the lab and comparing the crater morphology to learn about speed, angle of impact, density, effect of substrate, and how to make large holes in your boss' wall.



Close up on the interior of a fragment of the Cherbarkul meteorite (Credit: C. Mayer / F. Jourdan; Western Australian Argon Isotope Facility, Curtin University).

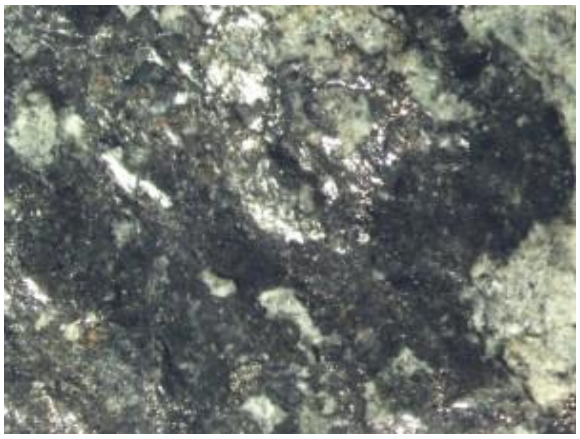
An International Monitoring System acquires data about sound activity from around the Earth. Although not explicitly geared towards detecting atmosphere-penetrating projectiles, the system does detect anomalous sound sources, such as from accidental explosions

(*glances at North Korea*), meteorite entries, volcanic eruptions, earthquakes, severe storms, and the coming of Cthulhu. On this occasion, the impact was heard from more than 20 infrasound monitoring stations from around the globe; not particularly useful as a warning system, but still pretty cool. These stations can also be used to estimate the energy release from impacts.



Close up on the fusion crust surrounding a fragment of the Cherbarkul meteorite (Credit: C. Mayer / F. Jourdan; Western Australian Argon Isotope Facility, Curtin University).

To finish, and a rather controversial point, when asked if we needed to invest more in developing early-warning and detection systems for near-Earth objects, one of the panellists, Alexander Deutsch (University of Munster, Germany), remarked that we don't, as we already have sufficient data to monitor all dangerously-sized projectiles. Apart from the Russian Fireball, apparently. Do we need to invest more in a global monitoring system?



Close up on the melt rock found within a fragment of the Cherbarkul meteorite (Credit: C. Mayer / F. Jourdan; Western Australian Argon Isotope Facility, Curtin University).

Peer Review Quality is Independent of Open Access, Science Communication Breakdown.

Open access is broken as a system. Or at least, that's what a recent article published in *Science* seems to indicate. The article argues that a "sting operation," conducted by John Bohannon, demonstrates that open access (OA) publishing is deeply flawed, because numerous OA journals accepted a scientifically and ethically flawed "spoof paper" for publication.

However, I'd argue that the article actually does little to damage the reputation and clear benefits of open access research, and instead exposes serious flaws in the traditional publishing model.

Bohannon submitted the spoof paper under fake names, getting 157 article acceptances and 98 rejections, all from OA journals that pursue the "gold" route to access, whereby you pay an up-front fee after acceptance to make the article instantly available and re-usable for free. (Note: only about 29 percent of journals actually charge publication fees).

On the face of it, this seems pretty bad for OA. And it is really quite bad. But it's bad for publishing in general, not just open access. With no control group for non-open access journals, we can't tell what the acceptance rate of phony manuscripts is in general, making it impossible to say anything about the relative strengths between OA journals and conventional ones. Ironically, this is one of the scientific flaws deliberately inserted into the paper, where the [made-up] authors "found" a drug effective on cancerous cells, but without testing the effect on healthy cells. It also says nothing about OA journals beyond those sampled, particularly in journals for other scientific fields.

To his credit, Bohannon is quoted here as saying "*You can't conclude that [online open access is a failure] from my experiment, because I didn't do the right control – submitting a paper to paid-subscription journals*." Bohannon's concession makes the *Science* piece even more awkward, as its article implies that the results of this study show that OA is a broken or dangerous business model: "*Some say that the open-access model itself is not to blame for the poor-quality control revealed by Science's investigation. If I had targeted the bottom tier of traditional, subscription-based journals, [David] Roos told me, 'I strongly suspect you would get the same result*.'"

Peer review is the process where experts in the field give feedback and comments on a research manuscript, before the paper is passed on to a journal editor, who then decides whether it should be published. In the majority of cases, these are volunteer academics (both the reviewers and editors). Peer review is the supposed gold standard for research articles, designed to apply rigour and scrutiny and weed out the bad research. However, it is important to note that having an article accepted through peer review does not make it correct forever.

It means that the two or three reviewers, based on their experience, found the article to be scientifically sound and acceptable as a progression of knowledge at that point in time. Most research articles begin with a literature review in the introduction, which is, in its own way, a form of post-publication peer review. It's not a perfect system for spotting bad science, but

it's the best we've got. Discussions about whether or not peer review is adequate in its current form are very much on-going (see here and here).

What's more interesting to me are the editorial decisions that led to acceptance. Thirty-six of the 304 submissions had review comments outlining the flaws in the spoof paper, but 16 of the editors still accepted the papers. A mismatch between the targets of peer-review and the role of editors, perhaps? I'd love to see a study into this on a broader scale.

Andy Farke, a scientist, commented on Twitter by asking which of the journals submitted to would pass a simple "sniff test." Often, these suspect journals look suspect just from a cursory glance at their websites. It would be interesting to see how many articles these journals had published since origination too – I've came across some which have published almost nothing, so some of the journals could have been little more than a name. This interactive map shows that many of the accepted articles were in India and Africa, which may say something about the intensive pressures to publish work there. Perhaps this is a wake-up call to researchers in those places to educate properly on publishing ethics.

Matt Cockerill, co-founder of BioMed Central (the first for-profit OA publisher) said on Twitter that Springer and BioMed Central both rejected the paper. Elsevier, Sage, and Wolters Kluwer are all publishers with journals that accepted the paper. Sage apologised and Wolters Kluwer shut down the journal in question immediately. But Elsevier claimed they had nothing to do with it, and they were "just holding the journal for a friend." (Actually, they said "we publish it for someone else" in the Science article.)

Two journals published by Hindawi (a mega-publisher of OA journals), and PLOS ONE, a megajournal often criticised for only conducting "peer-review lite," both rejected the paper – which is good news for them, and bad news for their critics. (Note: In my opinion, PLOS ONE does precisely what is needed to assess scientific and methodological soundness.)

So, frustratingly, the supposed publisher of top-class science, Science, has issued an article on a clearly flawed study that seems to be nothing more than a futile attempt to undermine the global progression of open access. The article may have been sexy, and will most likely be damaging, but is it good quality? I'd reject this as a reviewer. Of course, it would be prudent not to mention that, as retraction rate is strongly correlated with impact factor, Science with its impact factor of around 31 has one of the highest retraction rates for bad science in the business. Unfortunately, this hasn't stopped other media outlets from picking it up and using it to "expose" the flaws in OA publishing (e.g., The Independent).

There's an important point here that bears repeating. This is an analysis of peer review, which was conducted solely on OA journals – it shows nothing of the relative quality of peer-review between open access and non-open access journals. With new models of open, transparent peer review being developed in open access journals (see PeerJ and F1000 for examples), the old model of closed pre-publication peer-review is being pushed slowly into the shadows, and

it seems perhaps not a moment too soon. It is hardly the "Wild West" of publishing as Bohannon and Science would have you believe. Furthermore, it shows that the academic and publishing communities need to work better to build an identification system for unscrupulous journals and publishers, akin to Jeffrey Beall's infamous "Predatory Publishers" list.

Another *Science* article published at the same time as the OA sting article quotes Vitex Tracz, founder of F1000Prime and BioMed Central, as saying "peer review is sick and collapsing under its own weight." While this may be true, it certainly applies to both OA and traditional publishing, and certainly should not be used to undermine the overwhelming benefits of open access research. All this sting operation has achieved is to demonstrate that Science is a blind bee, which stung itself in its confusion.

And for those worried about predatory publishers, I believe Mike Taylor said it best, with something along the lines of: scientists aren't stupid; we know good venues, we know how to find them, and we can spot dodgy emails from a mile off. The way to combat them, simply, is don't publish with them!

"*The problem with saying that open access enables internet scamming is like saying that the problem with the international finance system is that it enables Nigerian wire transfer scams*." – Michael Eisen

2014

The future of scientific publishing.

Last night, the Society of Spanish Researchers in the UK, SRUK, hosted an event discussing the past, present and future of scientific publishing (event details). One thing that was nice about this discussion, compared to previous ones I've attended in London, was the number of practising academics in the room. Often, academics are excluded from the discussions about scholarly publishing, which is a bit odd when you know, they're the ones who actually need the services that publishers etc. provide.

Anyway, what did we all discuss?

Three great and varied speakers formed our menu tonight. For starters, we had Cameron Neylon, ex-scientista, and now the Advocacy Director for the megajournal PLOS. The main course consisted of Eva Amsen, also an ex-scientist, current epic science communicator and Outreach Manager for F1000Research. Dessert was the experimental Prof. Juan Aréchega, Professor of Cellular Biology at the University of Basque County, Spain, and Editor for the International Journal of Developmental Biology (note: not a predatory journal). I'll try and summarise some of their key points.

Neylon kicked off with what he assures us was a fully rehearsed discussion about the current issues and progress of publishing in a digital world. He reminded us that there are many different types of access – just making an article open access these days isn't enough; we have to consider the language that people read this in, and accessibility in terms of complexity. As such, we're entering an age now where science needs to be, and should be, communicated in a manner that has the greatest and broadest public good, or 'impact'.

One of the greatest issues we're currently facing is that the publishing models we have, and the incentives which drive research are adequate for a digital world. We now live in a time when information can be communicated rapidly and cheaply, but publishing is still for the large part stuck somewhere in the mid-20th century. In terms of assessment, we're still looking at this the wrong way too – it's often a case that where you publish is more important than what you publish, which to me makes absolutely no sense at all, apart from being really lazy.

How do we get past these issues? Well, as a community we need to find a way to align the incentives and needs of researchers (e.g., for career progression) with the incentives to make research as broadly accessible as possible for everyone. Because at the present, there is a distinct mis-match here, and it's a major fault within academia and publishing. This is especially so, as we're beginning to be able to ask increasingly sophisticated questions about how our research is used – the pathways to impact; it's not possible to measure anything from the magnitude of online discussions to the use of research in real-world applications.

Next up, Eva gave an account of how F1000 is pushing the boundaries of the current publishing models by allowing fast publication combined with post-publication peer review. She gave a nice historical overview of publishing, pointing out that since the first publication in 1665, and the first instance of peer review as we currently know it in the mid-20th Century, nothing much has changed about how we publish until recently. Journals used to act as the gatekeepers for science, when research was published in paper issues, and this is what made it restrictive – page limits. Now though, we don't have those limits thanks to the online world, but still these limits are often still imposed.

Eva made a strong case for transparency too – all F1000 articles are open access, naturally, but so are the reviews. This is great, as it means that no longer can peer review be all 'bitchy' or personal, something which I'm learning is quite a frequent occurrence – they have to be strictly about the science, as things should be. As well as this, they can provide a great educational tool for early-career researchers who wish to learn about how to do peer review.

Juan Aréchega finished off the session, with some, let's say rather interesting perspectives. Importantly, he demolished the idea of impact factors and journal branding as a measure of assessment. However, he seemed to get a bit muddled up by claiming that PLOS was the "*Tyrannosaurus rex* of predatory publishers", claiming that their system of peer review,

volume of publishing and the amount they charge meant they couldn't be a legitimate publisher. I really hope he is standing alone with this rather regressive perspective.

Anyway, here's a storify of the event with a few more details. Overall, it was a great discussion, and nice to see an entirely new audience in London engaging with the issues of academic publishing.

It's beyond time we ditched the impact factor.

"*I am sick of impact factors and so is science*."

Stephen Curry said it best back in 2012. The impact factor is just one of the many banes of academia, from its complete misuse to being falsely inflated by publishers.

I want to draw attention to a new article that addresses the causes behind this 'impact factor mania' that academia has.

The article is quite right to place the blame firmly in the hands of academics. It's our fault that the impact factor is still misused. No-one else. Almost every academic knows why the impact factor is flawed, but still we use it over and over to assess the quality of a person or an article. It's irrationality in its most blatant form, and you'd think academics would be smart enough to stop using it. But for some reason, we, as a collective, aren't.

This article addresses many of the causes behind this persistent misuse, abuse, whatever you want to call it. It's open access, so you can read it for free. Most importantly, though, share this with your colleagues. Academics who are against the impact factor – you do academia a dis-service by letting this irrational use persist without trying to combat it. A great starting point for 'conversion' would be to convey the importance of signing things like the San Francisco Declaration on Research Assessment (DORA).

My main feeling about why the impact factor still carries so much weight is partially due to a combination of fear and respect. Many of our senior colleagues and friends in academia will have ascended to their current positions based largely on assessments where the impact factors of journals they have published in will have er, factored in. No-one, I hope, wants to explicitly say that these senior faculty members have reached their positions based on something that's effectively meaningless in terms of how 'good' at science-ing they actually are. But this is one of the implicit statements made when saying that the impact factor is a false method of assessment.

A personal statement: I will never publish in a journal because of its impact factor. I don't care, not one little bit. If someone wants to judge my work based on that, they can, but I'll explain to them why they're wrong. I'm careful to suggest, however, that other PhD students adopt this stance, as many will still judge your post-doc worthiness based on the IF of journals

you've published in, and I don't want you to compromise your future careers. However, if you do choose to follow this stance, then kudos.

Getting rid of the IF is a cultural issue, and requires change from all facets of academia. It starts with engaging your colleagues. So, engage your colleagues.

Further reading: Brembs, B., Button, K. and Munafo, M. (2013) Deep impact: unintended consequences of journal rank, Frontiers (link).

Every time you publish behind a paywall, a kitten dies.

"*Every day, people are denied access to something they have a right to*."

That's the opening line from a new appeal from students Joe McArthur and David Carroll. Open Access describes a form of publication of research where articles are made instantly available for free, and with unlimited reusability rights, as long as the source is attributed. There are many pseudo-open access 'definitions' out there from publishers to obfuscate its use, but this is the only real, least restrictive one.

There has been a global open access movement over the last 10-15 years, which has accelerated so rapidly in the last year or two that many research funders and institutions, as well as government bodies, have developed open access policies. However, despite this progress, large commercial publishers like Wiley, Taylor and Francis, and Elsevier are still the most profitable industry in the world (with margins even higher than Apple), the majority of their profits coming from obscene charges for pdfs and library subscriptions for research articles and journals.

However, things are slowly changing. Publishers like PeerJ, F1000, PLOS, the BMC series, Frontiers, SAGE, the open Library and a host of new, more efficient (both financially and academically) platforms have emerged – the only resistance to these, and the reason why the aforementioned mega-publishers still survive and thrive off funds that could be going towards research, is the stubbornness of academics. And also simply for not knowing that they exist – unknown unknowns!

The open access button is a project designed to track whenever someone hits a paywall – is refused access to research – which inhibits them from learning, teaching, researching, and developing new ideas or technologies. At the moment, it is only beginning to scratch the surface of the barriers that mainstream publishers place in front of knowledge, but the second version will be much more efficient, and provide a tool, or piece of evidence, that the research community and others can use to demonstrate that the drivers for the publishing community (profit) is not aligned with the ideals of the research community – the maximum dissemination of research for the maximum possible benefit.

If you care about access to research, often which will have been paid for by you through taxes, do help support the button team – it's worth it.

Open Letter to The American Association for the Advancement of Science, The Winnower. Co-written/signed by 100+ authors.

This is an open letter concerning the recent launch of the new open access journal, *Science Advances*. In addition to the welcome diversification in journal choices for authors looking for open access venues, there are many positive aspects of *Science Advances*: its broad STEM scope, its interest in cross-disciplinary research, and the offering of fee waivers. While we welcome the commitment of the Association to open access, we are also deeply concerned with the specific approach. Herein, we outline a number of suggestions that are in line with both the current direction that scholarly publishing is taking and the needs expressed by the open access community, which this journal aims to serve.

The first of these issues concerns the licensing terms of the journal articles. The default choice of a non-commercial licence (CC BY-NC) places unnecessary restrictions on reuse and does not meet the standards set out by the Budapest Open Access Initiative. Many large funders, including Research Councils UK and the Wellcome Trust, do not recognise this as an open license. The adoption of CC BY-NC as the default license means that many researchers will be unable to submit to Science Advances if they are to conform to their funder mandates unless they pay for the upgrade to CC BY. There is little evidence that non-commercial restrictions provide a benefit to the progress of scholarly research, yet they have significant negative impact, limiting the ability to reuse material for educational purposes and advocacy. For example, NC-encumbered materials cannot be used on Wikipedia. The non-commercial clause is known to generate ambiguities and uncertainties (see for example, NC Licenses Considered Harmful) to the detriment of scholarly communication. Additionally, there is little robust evidence to suggest that adopting a CC-BY license will lead to income loss for your Association, and the $1,000 surcharge is difficult to justify or defend. The value of the CC BY license is outlined in detail by the Open Access Scholarly Publishers Association.

We raise an additional issue with the $1,500 surcharge for articles more than 10 pages in length. In an online-only format, page length is an arbitrary unit that results from the article being read in PDF format. Can the AAAS explain what the additional costs associated with the increased length are that would warrant a 50% increase in APC for an unspecified number of additional digital pages? Other leading open access journals, such as PeerJ, the BMC series, and PLOS ONE, offer publication of articles with unlimited page lengths. The extra costs create constraints that may adversely incentivize authors to exclude important details of their study, preventing replication and hindering transparency, all of which are contrary to the aims of scholarly publication. Therefore, it seems counterproductive to impose this additional charge;

it discriminates against researchers' best effort to communicate their findings with as much detail as necessary.

We feel that the proposed APCs and licencing scheme are detrimental to the AAAS and the global academic community. As such, we recommend that Science Advances:

1. Offers CC BY as standard for no additional cost, in line with leading open access publishers, so authors are able to comply with respective funding mandates;
2. Provides a transparent calculation of its APCs based on the publishing practices of the AAAS and explains how additional value created by the journal will measure against the significantly high prices paid by the authors;
3. Removes the surcharges associated with increased page number;
4. Releases all data files under CC0 (with CC BY optional), which has emerged as the community standard for data and is used by leading databases such as Figshare and DataDryad.

We hope that you will consider the points raised above, keeping in mind how best to serve the scientific community, and use Science Advances to add the AAAS to the group of progressive and innovative open access scholarly publishers. We hope AAAS will collaborate with the academic community to facilitate the dissemination of scientific knowledge through a journal committed to fully embracing the principles of Open Access.

We kindly request that you allow your response(s) to be made public along with this letter, and look forward to hearing your response soon.

Swing and a miss by the AAAS for open access.

The American Association for the Advancement of Science, the world's largest scientific organisation, recently announced their latest journal, the fully open access 'Science Advances'. While superficially this seems like a good move for them, digging into the details reveals many inherent flaws with the journal, that at worst portray the AAAS as a money-grabbing organisation and enemies to the real progress of science, and at best naive about the current state of scholarly publishing and the direction that the open access movement is pushing it in.

To that end, an open letter has been sent to senior members of the AAAS, including the Editor-in-Chief, and newly appointed Publisher of Science and strongly open access public figurehead (cough) Kent Anderson (of Scholarly Kitchen fame). It was edited and generally made considerably more punchy and better-worded by an army of crowd-sourced editors – it really was collaborative writing at its finest, and amazing to watch in real time! The letter quickly received media attention in The Scientist, as well as a couple of other outlets that I've lost the links to. The two major points the letter makes are the charges associated with

licensing and additional page lengths, both of which are not evidence-based judgements. All the details are in the letter, including recommendations for progress.

At the time of drafting this post, the letter has just passed 100 signatories. By the time of release of this post, the letter will have been submitted, but you can still add your signature to show support if you wish. The letter will also be published by The Winnower, as well as many other smaller outlets (all named in the Google doc). If you wish to share details of the letter on your blog or website, please do! The more people that can help make a splash about this, or raise awareness of the issues of how some publishers are handling open access, the better.

To me, this shows the great power of online communities. I'm confident we will get a response, and hopefully of the progressive sort, and even if we don't hopefully we'll have created awareness that academics can take the open access debate straight to publishers and try and make a difference. It's also worth noting that while we have several well-known senior academics as signatories, the majority are early career researchers, which is great!

The next step will be to draft letters to publishers that are apparently similarly flawed in some of their journal policies, as well as a letter to the Science Advances editorial board about the issues raised in the primary letter (leave a comment here or get in touch if you'd like to be involved – probably a smaller affair).

Many thanks to all who have signed, shared, or helped write the letter. I look forward to the response from the AAAS, and will post it on here if allowed. I pre-empt two things though – one, they mention their 'added value', and the impact of the 'Science' or 'AAAS' brand to justify their extortionate costs.

What causes high retraction rates in high-profile journals?

A Nature News piece is out today featuring comments from me, about how high retraction rates correlate with impact factors in scholarly journals. However, the piece cherry picks my comments a little, and doesn't really go into that much depth. Bjorn Brembs already has a response up, and seeing as when I was contacted for comments, I mentioned a piece of research from him and other colleagues, I feel it is in the spirit to echo what he mentions by publishing my full response to Nature here.

In response to a tweet about an article on retraction rates, I was contacted with the following questions: "*Did anything in particular inspire you to share this paper at this time? Can I assume that you feel the paper is still relevant?*"

My full response:

"The reason why I shared it? Well, in all honesty I didn't see the date, and just came across it and thought it was fairly relevant to a lot of current discussions about impact factors. I don't think studies like this really lose their usage that quickly. It's remarkably similar to a more recent study, in fact, that calls for a complete overhaul of the publishing industry and the use of impact factors (see Figure 1 here).

I do feel the paper is relevant still, especially given several recent 'horror stories' regarding retractions, and falsification of results. However, I do feel it is missing key discussion points, such as what is creating the pattern. I think there are two ways of reading it. The first, is that the 'publish or perish' culture very much alive and prevalent within academia is still causing academics to chase after 'high impact' journals, and in doing so are more likely to create incorrect results, deliberate or not, in the pursuit of achieving substantial enough results deemed worthy of 'top tier journals' – sensationalism over quality. The second way is that journals with higher impact factors generally have higher readerships, and as such increase the probability of detection of incorrect results. However, there is no current information that I'm aware of to support this latter link, beyond anecdote.

The raw way of reading it, however, is that the higher the impact factor of a journal, the increased probability that the contents within are wrong. I think although it is not as black and white as this, it is certainly another piece of evidence to caution against 'impact factor mania' within academia (something that I still see my colleagues suffer from on a daily basis, and try to engage with).

Perhaps more significantly is that it draws attention to the short-comings of peer review, if detection of incorrect results is not picked up during this screening process. Perhaps even further, it highlights the rift between editorial decisions and recommendations of review, highlighted in the 'Bohannon Sting' operation last year, if you recall (i.e., bad results, accepted for publication anyway). Either way, it highlights a need for more transparency in the review process – this will ultimately drive down retractions as mistakes can be detected and dealt with much quicker."

Anyway, that's my thoughts on glamour mags and retraction rates. What are yours? Have I missed any key information here too?

Top scientific publisher chooses not to advance open access, The Conversation. Co-written with Erin McKiernan.

Access to research is limited worldwide by the high cost of subscription journals, which force readers to pay for their content. The use of scientific research in new studies, educational material and news is often restricted by these publishers, who require authors to sign over their rights and then control what is done with the published work. In response, a movement

that would allow free access to information and no restrictions on reuse – termed open access – is growing.

Some universities and funding organisations, including those administered by governments, now mandate open access, recognising its potential to increase the impact of research paid for by public money. The United Nations is considering the importance of open access to ensure the "right to enjoy the benefits of scientific progress and its applications".

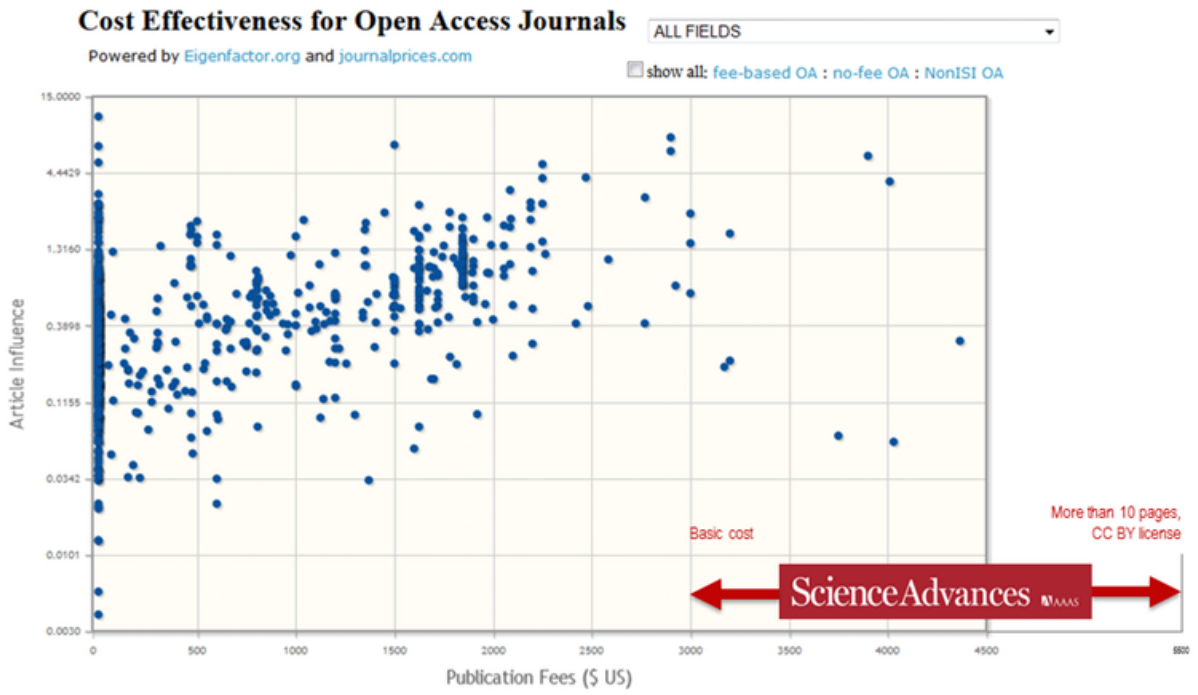
The American Association for the Advancement of Science (AAAS), which is the largest scholarly society in the world, has recently launched a new open-access journal. But its approach is at odds with that of other major open-access publishers and could impair the goals of the movement.

The journal Science Advances, to be launched in February by the AAAS, plans to publish articles under a license that would prevent commercial reuses by default. This includes publication on some educational blogs and incorporation into educational material, as well as reuse by small-medium enterprises. By definition, this is not open access. AAAS will give authors the option to publish their work under a fully open license, but will levy a US$1,000 surcharge on top of the US$3,000 base publication fee. A reason for this surcharge was not given.

Science Advances is going to be an online-only journal, but AAAS will also charge authors US$1,500 more to publish articles that are more than ten pages long. They believe editorial services are enough justification for this charge, but there is no calculation to support this claim. They reason this limit is also necessary due to concerns about brevity and writing quality. However, these issues can be addressed during peer review – a process by which scientists judge other scientists' work as objectively as possible and which is done at little to no cost to the journal.

Some scientists worry that a page-limit surcharge could lead to the omission of details necessary for replicating experiments, a core tenet of scientific research. Leading open-access journals from publishers such as PLOS and BioMed Central offer unlimited page lengths at no additional cost.

A comparison shows that fees to be charged by Science Advances are among the highest in the publishing industry.



By Zen Faulkes, author-provided.

AAAS says it is fully committed to open-access publishing, but an examination of its recent actions are cause for concern.

In October, AAAS's journal Science published a "study", claiming systemic problems with peer review at open-access journals. But it was severely criticised for its flaws.

In June, AAAS wrote a letter to Farina Shaheed, Special Rapporteur in the field of cultural rights at the United Nations. Shaheed is preparing a report on open access for the UN Human Rights Council. AAAS expressed reservations about open access, calling the movement "young", the approaches "experimental", and encouraging Shaheed not to ignore the potential benefits of the reader-pays publishing model.

In August, AAAS announced that Kent Anderson has been appointed as publisher of the Science journals and will oversee the launch of Science Advances. The choice of Anderson, a vocal sceptic of open-access publishing, was criticised by academics.

Concerns about AAAS's approach to open-access publishing recently led more than 100 scientists, including us, to sign an open letter to them providing recommendations to improve Science Advances. AAAS have not responded formally to the open letter, choosing instead to publish a FAQ which makes no changes to their policies.

Some of Science Advances's potential competitors have unfortunately taken a similar approach to open access. Nature Publishing Group (NPG) levies a US$400 surcharge for publishing under a fully open license in its journal, Nature Communications. The Society for Neuroscience will do the same, with a US$500 surcharge for open licensing in its new journal,

eNeuro. The American Chemical Society charges US$1000 for upgrading to an open license. In contrast, leading open-access publishers such as PLOS and BioMed Central offer open licensing as standard for no additional cost.

It is unfortunate that AAAS and others have chosen not to fully embrace open access and maximise the impact of publicly funded research. These are missed opportunities for the world's largest general scientific society to lead the way in increasing worldwide access to information.

"Open access wins all of the arguments all of the time."

One is rather inspired. OpenCon 2014 was a wonderful time bringing together the best minds in early career research and the 'world of open' to discuss how we make access to knowledge, data, and educational resources better for everyone. It wasn't so much an event*, as a milestone. Here's the story of its success.

I don't want to run through the basics of each aspect of open access, data, and education. Let me instead tell you instead about how we just marked a revolutionary point in making the fundamental right to research a reality. When I use the word 'publishers' through this post, I'm talking primarily about legacy ones – those who operate on a paywall-based model and publicly declare themselves to be enemies of progressing research (I'm not going to name names, we all know who they are – PeerJ is clearly safe). This does not include many learned societies, which I think are an invaluable component of academic communities and are a completely separate discussion we need to have.

There are some people I wish to directly acknowledge from OpenCon as true leaders in the open community.

Erin McKiernan is where everyone will be in 5-10 years, right now. Her views and practices regarding open access are something that we could, and probably should, follow. She made a simple statement, which for many is why we were there: "Access to research is not an issue for academics, it's an issue for everyone." She has pledged to make her research completely open, to not review for closed access journals, to use blogs and pre-prints where possible, to not publish in Nature, Cell, or Science, and to refuse co-authorship if co-authors refuse to be open; an admirable stance to take.

Ross Mounce is disruptive technology manifest. His work with Peter (see below) is truly revolutionary, in extracting data from multiple papers so that others may use them as a resource. A noble task indeed. I'm also happy to point out that Ross was one of the first people who introduced me to the issues of access to research, and it's always great fun learning from him as a friend. Myself and Ross will be talking about open data on Nov 26th at the OpenCon satellite event in London.

Peter Murray-Rust is the embodiment of righteous fury, aimed directly at legacy publishers. He set my heart on fire (I actually got heart burn.) with a passionate speech regarding exactly how the practices of many publishers are directly inhibitive to science, and what he is doing to combat this (e.g., the content mine). We need more senior researchers like Peter, so that early career researchers can be validated by their actions.

Jack Andraka needs no introduction. His views on open access, the fundamental human rights to knowledge, and education should be spread to every young person on the planet. He is a wonderful role model that we can all learn from, and I can't wait to see what the future holds for him – including getting his research to pass peer review 😉 A favourite quote from Jack was '*If a Katie Perry song costs $0.99, and a research paper costs $30, is it any wonder why kids aren't into science*?'

Joe McArthur and David Carroll are, simply, awesome. They are the brains behind the Open Access Button, and examples of how it is possible to initiate change from any step of the academic pipeline. As undergraduates, the pair of them successfully developed and launched the Button, creating what is undoubtedly one of the most exciting and hopefully change-initiating projects currently in the world of publishing, with plenty of exciting ideas for the future. David has also just written a story about how he was once forced to make a choice between publishing with Elsevier, or 'making the right choice'.

These were the people and the talks that stood out for me, although each and every person who came up to that stage was incredible. Hearing from Patrick Brown about how he originally set up PLOS, arguably the most 'disruptive' player in scholarly publishing at the present, was rather inspirational. He, among others, emphasised the role of and need for a community vibe for 'openness'. I loved his thoughts on academics 'taking the power back' from publishers, by being part of an entrepreneurial, subversive, and open community. Other inspirational talks include one by Heather Joseph of SPARC, on that our goal should be to set the default for academia to 'open', a goal echoed by every single person in that room.

The trend for openness on a global scale is increasing. Several examples include the RCUK policy on open access, a memorandum in the US stating that data from federally funded research must be made publicly available, the establishment of Open Access Nigeria, and the SciELO initiative, to name a few among thousands of progressive changes. Heather stated that in spite of this progress, it's still important that we make changes to the current system, and keep the global trend going for the benefit of everyone. One of my favourite quotes from OpenCon has to be from Ahmed Ogunlaja: "*Open access wins all of the arguments all of the time*." There is not a single evidence-based case against publishing your research open access, either through the use of open access publishers, or through self-archiving. I cannot stress this enough. I hear the same arguments against open access all the time, that OA costs too much for authors and publishers to be sustainable. This simply does not have to be the case – PeerJ are prime demonstrators that this is totally feasible. Don't pay $5000 for something

that you can get for $99. It's simple. I know I'm probably preaching to the choir with the readers of this, but it's so important to realise that alternatives to traditional publishing are better for both the author (e.g., OA increasing citations) and the reader (they can actually read it). We need to move from a model where we pay for prestige, to one where we pay for efficiency and openness.

I could ramble on for hours about all the amazing talks and people at OpenCon, but this post is already getting too long. So, permit me to go off on a related point that I think was largely missing from OpenCon.

One primary issue that still requires addressing within the open discussion regards careers, and the potential that dedication to OA publishing can lead to self-sabotage. Ironically, this claim often comes from those making decisions about others' careers, and is based around the very real fact that we currently don't have formal assessment criteria for academics that stretch far beyond the impact factor and perceived prestige of the journal in which an article was published. Clearly, this model is deeply flawed, and fortunately some policies such as that used by the REF in the UK explicitly forbids the use of the impact factor in assessments, instead relying on 'impact case studies'. You can sign Initiatives like DORA, pledging to find alternative and better modes of assessing academics.

The reason why I'm discussing this is that it is a real part of the open discussion which needs to be developed. Whether it is based on evidence or not, this is still one of the primary causes of resistance to open access, in my experience. Victoria Stodden addressed this point in her talk, stating that it should not be expected of early career researchers to 'martyr' themselves for the sake of open scholarship, but instead it should be senior academics leading the way forward. What we need to strive towards is a career structure that rewards people for being open and sharing their research. This isn't easy – it's going to require a community development strategy combined with a top-down policy framework within which to manage it. At OpenCon, we saw many of the people who are going to make the change. We also saw so many success stories of open access 'advocates' remaining highly successful within academia or redeploying their skills elsewhere to try and invoke change. The change is going to happen – we need to make sure that it is community-driven, and remove the element of risk – whether you believe it exists or not – from the 'anti-open' frame of mind. One great example of this at OpenCon was the discussion of establishing an 'O-index' as a metric of how open a researcher is, and something I cannot wait to see be developed.

So, I have a list of top recommendations or points for not just the 'open access community', but for everyone in academia, largely synthesised from numerous discussions and presentations at OpenCon.

Take the fight to publishers. Hold them accountable for the near-criminal business models they operate on, and the stranglehold they have had on academia for too long. Extending this, I need your help. I want to know if we initiate a formal investigation into the

practices of publishers, in terms of the fact that they operate within an unregulated market and enjoy enormous profits to commit immoral acts (creating knowledge inequality). The Office of Fair Trading no longer exists in the UK. I want to know what we can do, and if such an investigation is even feasible, and whether or not we have a legal case supporting us. Don't sacrifice your career. Unfortunately, many of the ideals we hold are incompatible with the reality of the current system. Peter said it best, that for any revolution blood will be spilled. If you're making someone angry, you're probably doing it right. But when you're 'advocating' for open access, maintain one simple rule: don't be a dick.

The last thing I want the open community to become is its own worst enemy. For this, I think we need to be really strategic about what we say, exactly how we say it, be aware of who is listening, and consider the perspectives of those whom we are trying to engage with. For example, I really don't think calling this progress the 'open movement' or that we are 'open advocates' does little more than alienate those who could otherwise be supportive. Things are changing. We have the evidence, we have many super-talented people, the best ideas, the moral, social, and economic cases, and open is going to triumph. It's much better to be part of something positive and progressive, than to look back in 20 years and regret the decision to stand in the way.

Help your colleagues. Scholarship is all about collaboration and the sharing of knowledge, and requires that we receive help from and help our colleagues. We are the informed community, and our friends and co-workers should be equally well informed about the issues with open access, impact factors, and all the others.

The fact that publishers place embargo periods on self-archiving manuscripts is an explicit declaration that they cannot justify the 'value' they add for the prices they charge. We need to change this. If publishers are afraid that an unformatted word document, that has passed [volunteer] peer review, is going to harm their income, they are not only shooting themselves in the foot, but also I think this highlights that they might have a little bit more to be worrying about regarding their business models.

If you have an idea, put it into practice. The community is there to help – you're not alone.

Most importantly, have fun being part of the open community! All I saw at OpenCon were happy, smiling faces. It was great to be part of that, and makes me confident that what we're all doing is right.

Final thanks to the organising committee, everyone involved to support the logistics of the conference, SPARC, the R2RC, PeerJ for their generous scholarship so I could attend, and every wonderful mind present. You all represent the future, and it is now.

*Turns out the fear that OpenCon was a plot by Elsevier to get all of 'generation open' in the same place at the same time to conduct, er, dastardly deeds, was unfounded…

One small step for Nature.

Macmillan have released an interesting press release, announcing that all research papers published in their 49 Nature Publishing Group (NPG) journals, including *Nature*, will be made free to read online, via one of Digital Science's pet projects, ReadCube (note that Digital Science is also owned by Macmillan). These articles can be annotated in ReadCube, but not copied, printed, or downloaded.

This is not open access*, and NPG have been very careful and explicit about stating this.

What is the reason for this move, then, when we have a globally shifting environment towards open access? Well, academics love to break rules. We share papers freely, and often illegally, with our colleagues all the time. It's a sort of passive rebellion against paywall-based publishers. A great example of this is #icanhazpdf on Twitter, whereby articles are requested, and then hopefully shared privately by someone else. This kind of activity is what NPG are calling 'dark social', like some terrible name for an evil media organisation. By this, they simply mean sharing, but out of their control. This new initiative seems to be a way of controlling, and legitimising this sort of 'peer-to-peer' practice.

Now, read-only versions of articles can be shared via special links for each article. Ross Mounce has called this 'Beggar Access' – you have to ask colleagues for access. Importantly, this still means that you need access to the articles in the first place (personal access or via an institution), but you are then free to share these articles, as long as they are viewed in ReadCube. John Wilbanks is rightly cynical about this, calling it "the canonization of a system that privileges the wealthy academic." The work is still paywalled, in the sense that you need a subscription in the first place to access it. The canonization aspect of this is that now, NPG are broadening their reach into how articles are shared and used.

This is significant. NPG want to control how you access, use, and share their articles. Combine this the fact that around 100 media outlets and blogs will be granted the ability to share read-only links (fusing access and accessibility – a good thing, generally), and we begin to see their strategy emerge. Another of Digital Science's investments is Altmetric.com, is a tool designed to track the sharing and use of individual articles, and provide a relative measure of 'digital activity' for it.

Now, what is Nature famous for? Apart from publishing anything that resembles a feathered dinosaur, it's known for its impact factor! The impact factor is dying. What we are moving too is a more complex system of alternative, article-level metrics that describe the broader use of an article (e.g., social media usage, media coverage, and article citations). This is used by some as a proxy for 'impact'. In the UK, HEFCE are investigating the role that metrics like this can play in research assessment. The Declaration on Research Assessment (currently only signed

by one UK university, the University of Sussex) is another example of how this is changing on a global basis.

So, all of a sudden, at NPG, we have a very controlled way of releasing articles under a sort of 'shadow' of open access (highly restricted, free-ish access), controlling how they're shared, and directing media coverage directly to them in a way that they can measure. Who needs an impact factor when you can demonstrate that your papers are still receiving the most attention out there, and generating the most 'impact'? This puts them way ahead of the curve of other publishers in inflating altmetrics scores, who don't have sophisticated systems like this yet backed up by pretty decent tech.

Is this a bad thing? Nope, it's really smart from Macmillan, makes sense, and is the next logical step for them to take in a publishing environment that's ever changing in the world of open scholarship. Is it the right thing to have done, though? I don't think so. There are too many restrictions, and I don't like the idea of one organisation trying to exert such control over this sort of thing. Open access is supposed to be a game changer. It's supposed to inspire creativity, disruption, innovation, and reform the market into one which is better for researchers and the wider public. This new initiative seems to only do one thing: stifle the above. The simple fact that re-use rights are prohibited says it all really (sharing only via ReadCube, no commercial usage). What it does, is allow NPG to make their articles freely available to subscribers (and now others via 'beggar access', as Ross calls it), but at the same time preserve their primary income source – subscription fees from libraries and individuals.

One can't help but feel this is the beginning of the 'tech arms race' of the open access movement; F1000 have in beta phase an awesome browser-based collaborative tool that's well worth checking out. Was the development of this enough to kick NPG and Digital Science into panic mode and release something a bit prematurely, perhaps...? Or maybe I'm being cynical. Free to read is still sort of a step forward, albeit even in this highly constrained sense.

The future?

This isn't the final word. The trial period for this is for one year, and subject to change. There is no reason why NPG aren't going to use this as a stepping stone to a full-open access model. I see this as them testing the waters, seeing what is feasible, and whether the strategy plays out in their favour. They're going to have to become full open access sooner or later, whether they like it or not. This change comes at a time when funding bodies around the world are creating open access policies of varying strength – the Gates Foundation recently implemented a very progressive policy that incidentally does not allow publication in Nature. If Nature don't conform to changing standards and practices, people will simply stop submitting there.

So, to me, this seems like half a step forward. While it might facilitate greater access of NPG articles, it does so in a restrictive and controlled manner. Worse, it might actually discourage

authors from self-archiving in future, which is arguably a better way of distributing research articles.

What this move does do, is take a teeny step towards knowledge equality. It replaces paywalls with a link-wall. It's still nowhere near as good as full open access like PeerJ or PLOS, but it seems to be a nod to the community that they're at least trying to progress in the right direction. Getting this shit right is really, really difficult for established organisations.

At the end of the day, though, this bores down to one thing: NPG are still operating under the pretence that they have a right to commercialise knowledge. That it is somehow theirs to exert control over. This is something I cannot support, at least until there is equal, unrestricted access for everyone.

*Note that Nature is already compliant with some open access mandates (e.g., the RCUK), as it allows self-archiving of the peer-reviewed post-print manuscript 6 months after publication. Also, note that 38% of NPG articles published last year are open access via the 'gold' route. The articles can also only be used for 'non-commercial' purposes, an unnecessary restriction that Nature Communications actually got rid of.

2015

Open Sesame! The Risks and Rewards of Open Data for Researchers, Digital Science.

Open access is a done deal. There is a clear global recognition that free and unrestricted access to research articles is a good thing for everyone. However, the movement towards more transparent scientific communication is not resting on its laurels. There is a new frontier in open science and that is data. Funders are increasingly mandating that researchers make their primary data available so that it can be built upon, though it's not all plain sailing. Many researchers remain unconvinced that it's in their own personal interest to share their data. In a post last year in the Scholarly Kitchen, Kent Anderson laid out some of the risks as he perceives them as a publisher.

Please don’t steal my ideas and data! Photo courtesy of Abi Hermann of the Spires-Jones Lab.

To help me write this post, Phill Jones of Digital Science put together some objections that he occasionally hears from those researchers who remain unconvinced. Below, I will explore and try to counter some of these frequently stated objections.

1) “If I make my data available, somebody will re-analyse it in order to undermine my conclusions. It’s easy to misrepresent data and I don’t want to make it easy for detractors to undermine my work unfairly.”

Raw data is the fuel of science. Re-analysing data and assessing conclusions forms one of the key pillars of research: reproducibility. Without making data openly available for assessment, research isn’t really research, it’s just anecdote. The debate that comes from the critical reanalysis of data and results is central to how science functions. We should embrace the increased visibility that opening up our data gives to all stakeholders involved in scholarly communications.

Developing upon research, whether to produce positive or negative results is an important way in which research progresses and knowledge accumulates. Furthermore, sharing your research data opens up more doors than it closes. It shows that you have confidence in your own work and have nothing to hide. It encourages scientific debate, scrutiny, and enquiry, and can lead to new innovations. From personal experience, I can also say that opening up my own data has enabled me to find new collaborators, enabling me to make a greater scientific impact.

It’s not about adding bricks to a wall – sometimes the wall has to be demolished to make way for a building. We shouldn’t be afraid to support researchers whose conclusions have subsequently been demonstrated to be incorrect. It’s OK to be wrong, and we should embrace this as a community.

2) "It takes me a long time to generate a data set. I frequently publish an initial analysis of data and then follow it up with analyses that are more in-depth or from a different perspective. If I publish my data, I lose control of it and somebody else might scoop me."

A false dichotomy?

This is where data citation comes in. The majority of data sharing platforms come with a Digital Object Identifier (DOI), or are licensed under a Creative Commons attribution license (CC BY), which means that data can be cited on the same level as research articles. This has yet to become widespread practice, but the more people that begin to cite data, the more common and accepted it will become. As a proponent of open science, I hope that one day soon, data citations will be considered just as valid as traditional article citations.

When your data is cited, you get additional credit for more research outputs than just a paper. If you're into metrics, then the number of citations is a pretty important figure for an individual, which can play a role in funding applications, hiring, and promotion. A study by Heather Piwowar and Todd Vision shows that there is a clear citation advantage to making your data open. In addition to this, they found that this advantage persisted for years beyond the time period in which the researchers had maximally used their data to publish papers.

Some publishers are also now creating 'data journals'. In these journals, data are published without any discussion or formal results. All this taken together, we are beginning to see a trend towards increasing reward for open data. For open science to move to the next level, the research community and funding bodies must recognise that data are at least as important as traditional research articles.

One possible solution to mitigate the risk of being 'scooped' is the creation of data embargoes, similar to the green open access embargoes that many funders and publishers have negotiated. An appropriate system of embargoes, where data is not released alongside a publication, but delayed for a suitable amount of time, would protect authors' abilities to maximally exploit their own data for personal research and publication.

3) "The data that I have is in a highly specialized format that other people cannot necessarily read, let alone interpret. Aside from the fact that many repositories don't accept my file, I

hear that I have to make my data interpretable. I simply don't have the time to process my data or convert its file type so that people outside of my field can take advantage of it."

What I think is becoming clear is that community-dependent standards for data sharing simply do not exist. What would make this much simpler if guidelines existed to help researchers develop and construct their data in a manner that is interpretable and usable by external parties. Developing best practices for data reuse and sharing, including good metadata, common repositories, and proper citation for appropriate credit are all ways to try and achieve this.

There is an ever-expanding range of options for scientific data formats. Subject specific repositories, for instance often offer niche file support for specific disciplines. Institutional repositories are arguably lagging slightly in terms of file support, but some commercial offerings are highly flexible. Figshare, for example, will extend support for any file type upon request.

There are admittedly still more to discuss and several issues to explore. Questions regarding the opening up of commercially or medically sensitive, or industrially-funded, data are examples. Whether or not sensitive data are made openly available should be assessed on a case-by-case basis depending on the situation. There are also open questions surrounding data duplication and negative data, but I'll leave those for a subsequent post.

Researchers all want to contribute to the global pot of knowledge, that's why we do what we do. Let us return to and embrace this principle of open research, and make our data open – who knows what might be achieved, and who knows what might be lost by restricting access to it.

A letter to the Editor of the Zoological Journal of the Linnean Society.

This post is one inspired by the actions of Ethan White and a couple of other ecologists. Spurred on by their actions, I decided to write a letter to the Editor of a major journal in my field, the Zoological Journal of the Linnean Society. Ethan has performed similar actions too, and this letter draws quite a bit on what he has previously written. The theme revolves around requesting that the Linnean Society journals allow submission of manuscripts that have been previously published as a preprint (a non-peer-reviewed version of a manuscript), as the present policy is not supportive of open research and the rapid and free dissemination of research. Anyway, here's the letter:

Dear Dr Hayward,

I am writing to ask that you support the scientific good by allowing the submission of papers that have been posted beforehand as preprints.

The benefits of preprints are demonstrable and varied:

1. The rapid and open communication, discussion, and debate of important scientific results;

2. Improved quality of published research by increasing the scope for more extensive pre-publication peer review;

3. A more democratic and fair way for establishing who contributes to the peer review process;

4. A way for early-career researchers to demonstrate productivity and impact on a time scale that matches their need to apply for postdoctoral fellowships and jobs.

I am writing to you as a pending author with the ZJLS (with a single co-authored manuscript in review), and in recognition that the current policy for the ZJLS (as assessed through the Sherpa/Romeo portal): a 12 month embargo period on postprints, and deposition of a preprint only upon publication of the final version of record. As such, the current policy acts to restrict the rapid dissemination of research, to the point of the benefits outlined above, or states that if a preprint has been published then submission to the ZJLS is disqualified.

The standard justification from journals for disallowing the use of preprints is that they comprise a mode of 'prior publication'. However, preprints are not peer reviewed in the formal manner. They are the digital, and more open, extension of a long-held practice of sending manuscripts to our colleagues for friendly review prior to journal submission. The internet has allowed us to take advantage of this at a hitherto unprecedented scale. In fact, in Physics and Mathematics, such practice has been adopted as part of research culture since 1990, primarily through use of the arXiv (which has a biosciences option).

Furthermore, many journal considered to be 'leading' or 'top' by researchers all allow the submission of manuscripts to them that have already been deposited online as a preprint, including (but not restricted to) Science, Nature, PNAS, the Ecological Society of America, The Royal Society journals, and numerous titles published by Wiley, Springer and Elsevier.

Additionally, in 2013 a publication by our colleagues developed a strong case for open preprints in Biology, and is worth reading their perspective for a broader range of insight into this topic.

I understand that with the ZJLS, there is the additional dimension to consider of new taxonomic names. Therefore, I suggest that if a preprint policy be developed upon, there should be an explicit opt out policy for manuscripts that deal with novel taxonomic nomenclature, to avoid future confusion.

I ask that you, as the Editor of the ZJLS, take serious consideration of the benefit of preprints to the broader, more open communication of zoological research, as part of an already rich

culture of pre-publication discussion of research (e.g., through conferences and open debate with colleagues). With servers such as PeerJ preprints, and the biorXiv, this practice is easy to implement from a researcher's perspective. If possible, such actions could, and demonstrably should, be extended to other journals managed by the Linnean Society.

Kind regards,

Jonathan Tennant

The rise of open research data, Wiley.

As a junior researcher in the UK, it has given me great pleasure over the last few years to see the dramatic development of open access publishing. Most major research funders in the UK now require public access to published research articles in one form or another, and many other research-intensive nations across the globe are following suit.

Along with this global increase in public access to papers, there has been a gear shift in demand for the availability of additional outputs of research, including code, videos, software, and raw data. One of the most recent steps in increasing access to these outputs has been the RECODE project for researchers in the EU, which seeks to develop an open data ecosystem through shifting research practices. With progress being made in the USA too, the wheels are truly in motion towards a global shift towards open access to all research outputs.

For researchers, there is a clear incentive for making your research data open – for example, through enhanced citations of your research, but also in making the clear statement that you are not afraid to have your research openly scrutinized and built upon. It can be very difficult to trust the research in a paper, when there is a refusal to make the underlying data openly available.

The recent partnership between Wiley and Figshare is a more than welcome development. As Wiley is one of the dominant publishers of global research, liberating the data behind those publications will be a great advantage for the development of 'open science'. Wiley joins other publishers, such as PLOS, in recognizing the value of open research data. There are several levels to achieving open access to research data, and embracing the full power of the Web, and this partnership provides important steps to achieving this. There is still a dependence on researchers to making their data available in appropriate formats, and in a transparent context.

From a personal perspective, Figshare have always been one of my favourite players in the rise of open scholarship. Founded by Mark Hahnel based on frustrations in not getting full recognition for all of the outputs of his PhD, it has grown into a platform where pretty much any digital output from research can be freely and easily shared. Most importantly, from a

researcher's perspective, anything which is shared is citable through possession of a DOI (a unique digital object identifier), and protected through appropriate use of Creative Commons licenses.

With this new partnership, and the increasing global interest in open data, comes additional questions regarding appropriate data sharing and citation practices, as well as the recognition of outputs beyond papers when it comes down to academic assessment criteria. As many funders now require data to be more openly available, it comes down to the combination of these funders to make sure that credit for making data open is given, and for researchers to recognize that research outputs go beyond the generation of a pdf manuscript.

One of the biggest hurdles to cross is making data re-usable – simply having data available is not much use. What is needed is transparency in data creation and development, and the creation of community-based data sharing standards that allow other researchers to be able to re-use and innovate using open data. Part of this relies on making sure shared data is machine readable, and with transparent methods regarding its use. Journals should make sure that methods sections are suitably detailed, and form the core of manuscripts, instead of being neglected to a short note towards the end of papers.

The next step for publishers and funders is to enforce the sharing of the data behind publications. There is a clear role for academic editors here, in making sure that data is available via a public archive such as Figshare, upon publication of a manuscript, as well as in encouraging data citation. Where needed, appropriate embargoes can be applied to datasets, which can be important for early career researchers who want to maximize personal usage of the data they have generated. As Figshare provides an institutional service, this could be a great way to achieve support for open data practices closer to home for researchers.

There really is no excuse for not having data openly available to support papers these days. With this, researchers will be able to re-analyse and develop data, and open new doors for research. By embracing the principles underpinning open access to research data, researchers ultimately enhance global scientific discourse, and who knows what we might be able to achieve!

My open science story, The Winnower.

It never really occurred to me not to be open. From the moment I started my PhD, I made a promise to myself that everything I did would be open and transparent. By this, I don't just mean access to published papers – I wanted the data, and the information that I was generating to be freely available, and understandable to everyone. Apparently, this makes you a 'radical', but to me the alternatives just didn't appeal. I didn't see the sense in paywalls, in not sharing, in doing things for any reason but the benefit of the commons.

I remember during my Masters, back in 2011, vowing that my first paper would be published in PLOS ONE – I couldn't fathom the idea that research I'd spent so long on wouldn't be freely available. It took 3 years, but I eventually made it happen. My next paper was in PeerJ – I wanted to show that publishing open access early on in your career doesn't cost anything, and is the easiest approach that benefits the most people. That's when I really started to get into open science. Hitting paywalls when trying to do your research, or not knowing where the data was to support the conclusions of papers – these are huge impediments to researchers at all levels, and frankly I didn't understand why it was the norm.

Everything took to a whole new level before my PhD, where I was fortunate enough to work as a policy intern with the Geological Society of London. There, I learned about the broader role of science in society, and about how science is about so much more than, well, science. Science really affects every aspect of our daily lives, from the water we drink and the air we breathe, to getting to work, and being able to write this essay.

It seems to me to be wholly unreasonable that one of the underpinning facets of society – knowledge – is treated as a business commodity, and not something that is equally, democratically, and freely available to every person on this planet. I think this matters inside and outside of the academy, be you a teacher, and engineer, a doctor, or a cook.

Since starting my PhD, I've been involved in many aspects of increasing our understanding of open science. The most popular one of these appears to be the publishing of the Open Research Glossary, designed to help inform academics about the broad range of things that falls under the umbrella of 'open scholarship'. I helped lead the open community against poor publishing practices regarding open access by the AAAS, which culminated in an open letter to the Editor in Chief and substantial media coverage. Alongside these one off projects, I continuously try to raise awareness of the issues regarding open science, and science communication more broadly. I try to practice what I preach by engaging in open practices, and communicating about science to broader audiences. Mostly, this has been via blogging and tweeting about science, and some of the issues that are most close at heart for me, such as open science. I use tools like Figshare to share my research as soon as it's ready, and only publish in open access venues (when I have influence on the choice). Ultimately, this has led to numerous guest posts in popular online venues, and my personal invitation to several prestigious conferences, including SciFoo Camp, and OpenCon two years running. I like to think that invitations to give talks, participate in workshops and panel discussions, and being interviewed about open science for international media venues, is a sign that what I'm doing at the very personal level is the right thing. Or at least interesting enough that others can learn from it!

Honestly, I don't consider what I've done to be a success story. I don't do this for myself, but what I do see are little victories, little nudges that show that as a practising scientist, advocating for openness throughout the system is the right thing to do. I don't have data to

support this, but I have experience. The exact moment I knew that the open science community was right, was during Open Con 2014 in Washington DC. I have never known such passion, such drive, such desire to come together as a global community and advocate for something so simple, yet so hard to obtain – knowledge equality. For me, whether this translates into career success is yet to be seen – I'm still only coming to the end of my PhD. But what I do have are skills and experience that will hopefully provide me increasing options to transfer to the next level.

I think at the end of the day, we really have to consider what science is. It's about knowledge generation, about sharing the wonders of our mystical universe. Somewhere along the way, we've lost this – as a system, as a global community. Open scholarship, or open science, is the bridge we need to return science to its origins.

In 5, 10, 15 years, I don't want to be talking to people about open science: I want this to just be science.

A thought on impact factors.

OK, bear with me on this one. It's a bit of a thought dump, but it would be interesting to see what people think.

You can't go anywhere in academia these days without hearing about impact factors. An impact factor is a metric assigned to a journal that measures the average number of citations per article over the preceding two-year interval. It was originally designed to help libraries select which journals were being used by academics in their research, and therefore which ones they could not renew subscriptions to. However, in modern day academia, it is often used to measure the individual 'impact', or quality, of a single paper within a journal – that is, the metric assigned to a journal is used as a proxy for the value of each article inside. It doesn't make much sense on the face of things, especially when you hear stories about how much impact factors are gamed (read: purchased) by journals and their publishers (see link below), to the extent that they are at the least meaningless, and at the worst complete lies.

The evidence suggests that the only thing that an impact factor, and journal rank, is reflective of is academic malpractice – that is, fraud. The higher an impact factor, the higher the probability that there has been data fudging of some sort (or higher probability of detection of such practice). A rather appealing option seems to be to do away with journals altogether, and replace them with an architecture built within universities that basically removes all the negative aspects of assessment of impact factors, at the same time as removing power from profit-driven parasitic publishers. It's not really too much a stretch of the imagination to do this – for example, Latin America already uses the SciELO platform to publish its research, and is free from the potential negative consequences of the impact factor. University College London also recently established its own open access press, the first of its kind in the UK. The

Higher Education Funding Council for England (HEFCE) recently released a report about the role of metrics in higher education, finding that the impact factor was too often mis-used or 'gamed' by academics, and recommended its discontinuation as a measure of personal assessment. So there is a lot of evidence that we are moving away from a system where impact factors and commercial publishers are dominating the system (although see this post by Zen Faulkes).

But I think there might be a hidden aspect behind impact factors that has often been over-looked, and is difficult to measure. Hear me out.

Impact factors, whether we like it or not, are still used as a proxy for quality. Everyone equates a higher impact factor with a better piece of research. We do it automatically as scientists, irrespective of whether we've even read an article. How many times do you hear "Oh, you got an article in Nature – nice one!" I'm not really sure if this means well done for publishing good work, or well done for beating the system and getting published in a glamour magazine. Either way, this is natural now within academia, it's ingrained into the system (and by system, I include people). The flip side of this is that researchers then, following this practice, submit their research which they perceive to be of 'higher quality' (irrespective of any subjective ties or *a priori* semblance of what this might mean) to higher impact factor journals. The inverse is also true – research which is perceived to be less useful in terms of results, or lower quality, will be sent to lower impact factor journals. Quality in this case can refer to any combination of things – strong conclusions, a good data set, relevance to the field.

Now, I'm not trying to defend the impact factor and it's use as a personal measure for researchers. But what if there is some qualitative aspect of quality that it is capturing, based on this? Instead of thinking "It's been published in this journal, therefore it's high quality", it's rethinking it as "This research is high quality, therefore I'm going to submit it to this journal." Researchers know journals well, and they submit to venues for numerous reasons – among them is the appropriateness of that venue based on its publishing history and subject matter. If a journal publishers hardcore quantitative research, large-scale meta-analyses and the sort, then it's probably going to accrue more citations because it's of more 'use' – more applicable to a wider range of subjects or projects.

For example, in my field, Palaeontology, research typically published in high impact factor journals involves fairly ground-breaking new studies regarding developmental biology, macroevolution, extinctions – large-scale patterns that offer great insight into the history of life on Earth. On the other hand, those published in lower impact factor journals might be more technical and specialist, or perhaps regarding descriptive taxonomy or systematics – naming of a new species, for example. An obvious exception to this is anything with feathers, which makes its way into Nature, irrespective of its actual value in progressing the field (I'll give you a clue: no-one cares about new feathered dinosaurs any more. Get over it, Nature).

So, I'll leave with a question: do you submit to higher impact factor journals if you think your research is 'better' in some way. And following this, do you think that impact factors capture a qualitative aspect of research quality, that you don't really get if you think about what impact factors mean in a post-publication context?

'Open' is about equality.

OpenCon 2014 was an epic milestone for the global research community. OpenCon 2015 was different. OpenCon 2015 was a storm. Never have I seen such energy, such drive, such raw creativity unleashed than on the few days we had in Brussels.

Designed to bring together students and early career researchers from all facets of research and from all corners of the globe, OpenCon 2015 is about empowering the research community to advance open data, open access, and open education.

Throughout the event, I began to wonder whether we might be using the wrong words to describe what we do. We talk about 'open' as in free to read, free to access, free to remix and re-use, etc. – some or all of these things depending on who you talk to. These words have also been hi-jacked by commercial publishers, to the extent that we now think of 'open' as an additional 'service' which we have to pay for.

But I think what the 'Open Community' is really championing is something much more fundamental here: **freedom** and **equality**; the removal of barriers. It's not about 'open access', it's about 'equal access' – open levels the playing field. What it provides is a new baseline, stating that every single person on this planet, if they choose to, has the freedom and the opportunity to access the outputs of research.

Mike Eisen, co-founder of PLOS, quizzes our panel!

I think there are still many misconceptions that the OpenCon community need to work better at too. We still have researchers who don't believe that research papers should be available to the public for whatever reason, despite the simple fact that over 700 organisations across the world now have open access policies. This kind of ivory tower way of thinking is slowly fading away, but still remains prevalent in some areas. Which means that we're failing to get our message across properly, and need to think of new ways to make the 'case for open'. In addition to this, one thing which I feel we need to think more about is the perception of the community. I think a lot of people from outside the 'open community' see us as trying to bulldoze our way through research and publishers, and how dare those young knaves talk about a system which they don't fully understand. Well, I don't think you need to spend too long talking to people (academics and non-academics) about our current publishing system before serious questions pop up ("Wait, you create all the content, pay publishers to take it, then they sell it back to you for billions?"). It's not difficult to understand the system – it's crap, and it's broken.

Some messages were less subtle than others at OpenCon

But either way, I think we need to think about ways of being more inclusive, and sharing our collective expertise. There will always be some rocks that you can only break with a hammer, but a fast-flowing stream knows how to flow around them, and with enough force get them moving in the same direction. Not a single person in the OpenCon community is doing what they do for personal gain. We're doing it because we have a vision, and we're collectively passionate about how to achieve it. The danger with any passionate community is that it can come off as cliquey to those outside of it, and we should really work hard to make sure that we maximise the inclusivity and participation in what we do, by sharing what we love and by sharing our understanding.

Panel on student community initiatives that I had the pleasure of moderating

Gear shift! The participation and quality of projects at OpenCon was so awesome, that after just one year I felt like I'd been left completely behind! Thankfully, you don't need me to tell you all about them, as you can watch them all online here! Some of the highlights for me included some of the community driven projects, like OOO Canada (yep), hearing the history of the 'open movement' from Mike Eisen, learning that Erin McKiernan had a new job despite taking one of the most 'risky' stances on open ever as an early career researcher, hearing from the founder of Wikipedia, Jimmy Wales, the PhD Starter Kit from Achintya Rao, and a new website that Erin had launched on why open research just, works.

We love you Jimmy, we do! With Jimmy Wales, Ross Mounce, and Mike Taylor.
Photobombed by a certain PLOS co-founder..

I had the pleasure of hanging out with Leah and Donna of the PLOS team too, and telling people about our new PLOS Paleo group! For me, I still think the combination of open access publishing with increased 'accessibility' through blogging (etc.), tied with a real research

community vibe, is an awesome and important step forward, and am greatly thankful to PLOS for all their work in this.

The wonderful Donna and Leah at OpenCon!

I wrote about how amazing OpenCon 2014 was last year here, with the simple heading 'Open access wins all of the arguments all of the time', a quote from Ahmed Ogunlaja. This is still, I think, true. Except I think we're failing to convincingly make these arguments for one reason or another. Part of this is simply due to the democratic process of policy making, in that it's not just researchers who have a stake in the research domain. Part of this is due to deeply entrenched ideology. Part, in some cases still, due to ignorance, arrogance, a sense of academic entitlement, and narrow-minded 'ivory tower' perspectives (the Palaeo community, to me, seems way ahead of the curve on this). Whatever the reason, there are several things, as always, I think that researchers can do to help themselves, the research community, and global research quality:

1. Inform yourself about the issues to do with 'open', and talk to your colleagues about this. To me, empowerment is about knowledge. We built the Open Research Glossary after OpenCon last year to help with this. This year, we're writing a paper on the 'evidence for open'. Knowledge is power, and wisdom is gaining understanding through that knowledge. Erin's new site is perfect for this, and includes some very clever artwork.

2. Help to address a broken research assessment system. Impact factors suck. We've drafted an open letter template for communities to encourage their research institutes to sign DORA.

3. Become informed about broader topics such as copyright reform. We heard from Julia Reda MEP at OpenCon about her work trying to reform copyright in the EU, and the

damage that non-sensical copyright laws have on prohibiting academic freedom. Chris Hartgerink wrote about how Elsevier are actively preventing him from carrying out his research. During OpenCon, this led to an open letter about copyright reform in the context of text and data mining, which I believe received a tonne of signatures and has been submitted to the President of the European Commission already. Win.

4. Think about what academic infrastructure is, and how we can help to remodel one for a more efficient research process. Björn Brembs gave a stellar talk about this.

5. Be brave. There is so much talk about risk, mostly to do with careers, surrounding 'open discussions'. I don't want anyone to martyr themselves for this cause. But be brave, and participate in discussions, and champion what you believe in. There's no point sitting around waiting for someone else to have your idea and fix things.

I have to finish with my deepest thanks to the incredible OpenCon organisers and organising committee (especially Nicole, Joe, Shawn, and Nick) for creating such an epic conference, and inviting me again (still trying to figure that one out). You guys are beyond awesome, and without a doubt some of the most incredible people I've ever had the pleasure of meeting.

Down with the impact factor.

The impact factor is one of the most mis-used metrics in the history of academia. Stephen Curry and others have written much about the 'impact factor' disease, stating that if you use it in almost any form then you're "statistically illiterate", something which I'm inclined to agree with.

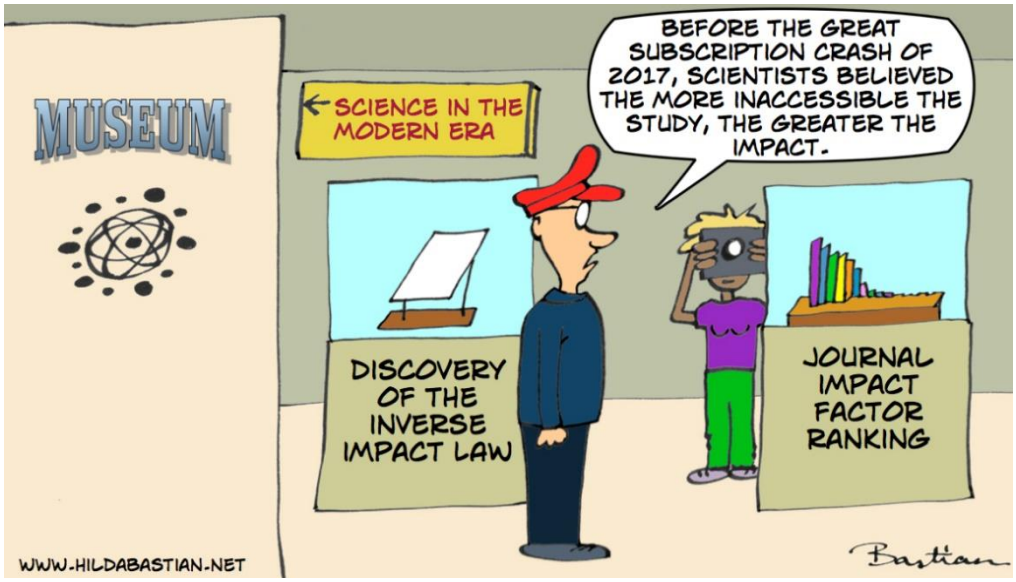


Image by Hilda Bastian

But such conversations about the impact factor are designed for one-on-one combating of its use. We often talk about 'changing the culture' of research assessment, which addresses the bigger picture of research assessment. And that means getting those who pull the strings to listen and make the changes we all advocate for. To that end, I've drafted an Open Letter template for researchers (with help from the community). This letter is to send to people in positions of power at different institutions, co-signed by as many academics as possible who believe in fairer and evidence-based assessment. It can be re-mixed, shared, edited, whatever you want. It's just a tool to help empower researchers make the change we advocate for against the prevalent mis-use of the impact factor.

In the UK, there are currently only two universities (Sussex and UCL) who have signed DORA, the San Francisco Declaration on Research Assessment. This Declaration recommends for Institutions:

1. Be explicit about the criteria used to reach hiring, tenure, and promotion decisions, clearly highlighting, especially for early-stage investigators, that the scientific content of a paper is much more important than publication metrics or the identity of the journal in which it was published.
2. For the purposes of research assessment, consider the value and impact of all research outputs (including datasets and software) in addition to research publications, and consider a broad range of impact measures including qualitative indicators of research impact, such as influence on policy and practice.

There is absolutely nothing to lose from employing these recommendations. All we gain is an enriched and informed process of evaluation, and one which does away with non-sensical, mis-used metrics that are more purchased than earned anyway.

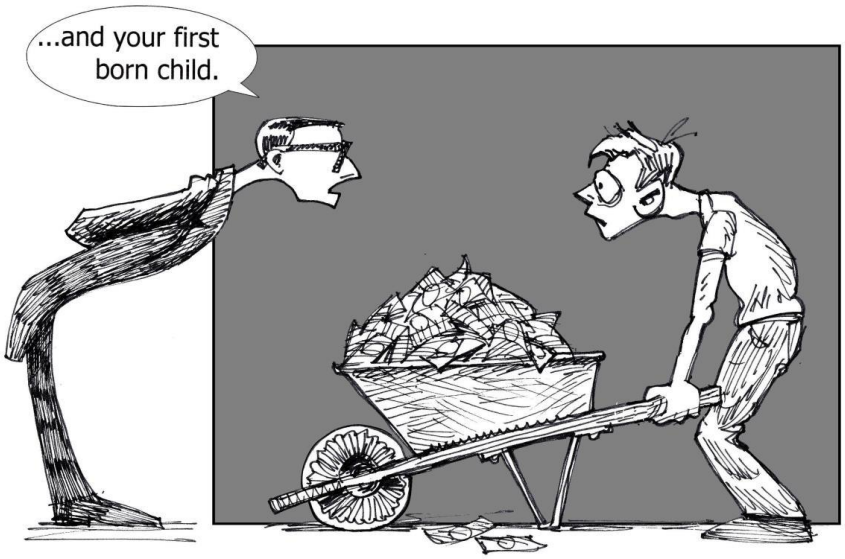
So, take this letter, sign it, share it, and become the change[1].

Why Open Research?

One of the most frequent moans from researchers about why they don't like open access, open data, open science (etc.), is that they value their careers over being open. I have no idea where this false dichotomy came from, or how it appears to have become so embedded in the minds of early career researchers, along with a frequent perception of callousness or nonchalance towards transparency in research.

Thankfully, a new site has been launched by open science superstar, Erin McKiernan, called Why Open Research? It highlights why practising 'openness' as a researcher is good for selfish reasons, as well as those for the greater public good.

[1] Sadly, this letter seems to have disappeared and I can find no trace of it in my archives.

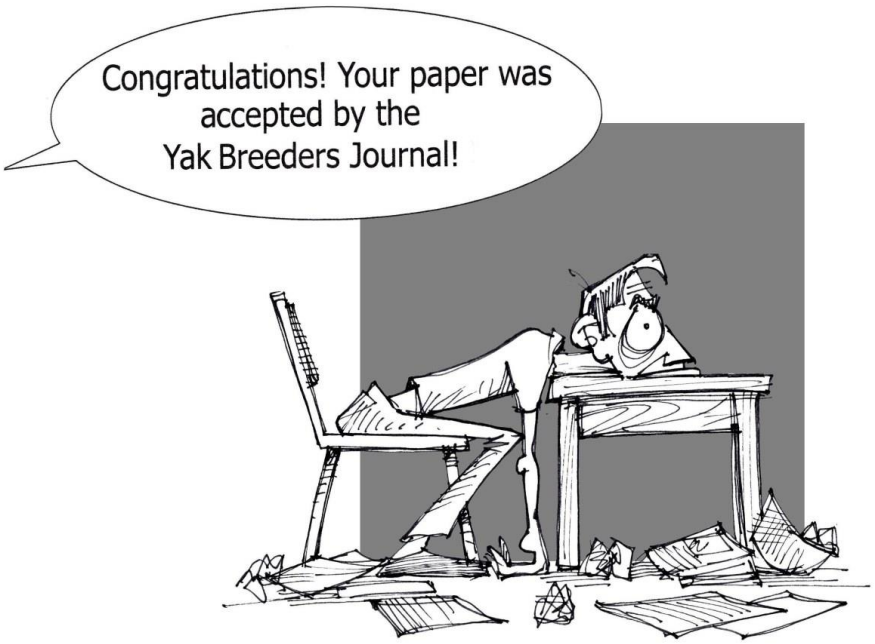


Credit: John McKiernan.

Key points include:

1. You can publish wherever you want, and still commit to open access. There are cheap publishing options, fee waivers, and self-archiving options all available.
2. Open research and a commitment to transparency are becomingly increasingly recognised as important in all steps in academic career pathways.
3. Learn what your funder says about open access. Many have special funds to support you.
4. Take back control as an author! Know your rights!
5. Open increases your visibility as a researcher, and the re-use of your work (which is why we all publish in the first place, right...?)

It’s really worth checking out, and some of the artwork is just hilarious too.



Credit: John McKiernan.

On this final point, Erin and a range of awesome colleagues have published what I hope will become a strong foundation for open access advocacy and education. I don't often say 'all researchers should read this', but all researchers should read this. It's a new paper called "The open research value proposition: How sharing can help researchers succeed", and published online via Figshare.

Contrary to what I hear a lot of the time, it draws parallels between openness, transparency and sharing in science (also called "science") with academic success. This is important, as it combats a lot of the fear, uncertainty, and doubt, especially among early career researchers, about how being open will compromise their research careers.

Here's the abstract:

"Open access, open data, open source, and other open scholarship practices are growing in necessity and popularity, rapidly becoming part of the integral workflow of researchers. However, widespread adoption of many of these practices has not yet been achieved. Understandably, researchers have concerns as to how sharing their work will affect their careers. Some of these concerns stem from a lack of awareness about the career benefits associated with open research. Herein, we review literature on the open citation advantage, media attention for publicly available research, collaborative possibilities, and special funding opportunities to show how open practices can give researchers a competitive advantage."

And the summary:

"The evidence that openly sharing articles, code, and data is beneficial for researchers is strong and building. Each year, more studies are published showing the open citation

advantage; more funders announce policies encouraging, mandating, or specifically financing open research; and more employers are recognizing open practices in academic evaluations. In addition, a growing number of tools are making the process of sharing research outputs easier, faster, and more cost-effective. In his 2012 book Open Access [7], Peter Suber summed it up best: "[OA] increases a work's visibility, retrievability, audience, usage, and citations, which all convert to career building. For publishing scholars, it would be a bargain even if it were costly, difficult, and time-consuming. But…it's not costly, not difficult, and not time-consuming." (pg. 16)

That final point for me is key. Being open is actually easier than it is to be 'closed'. Sharing is a fundamental aspect of science, and researchers need to endeavour to make sure that they do everything within their power and knowledge to be as open and transparent as possible. Anything else isn't really research, it's just anecdote.

OpenCon comes to Berlin!

A few weeks ago, OpenCon hit Brussels in a tidal wave of awesomeness, and led me to thinking about how open access and all that jazz aren't really about just making papers openly available, but in making the statement that knowledge is something that everyone has equal rights to.

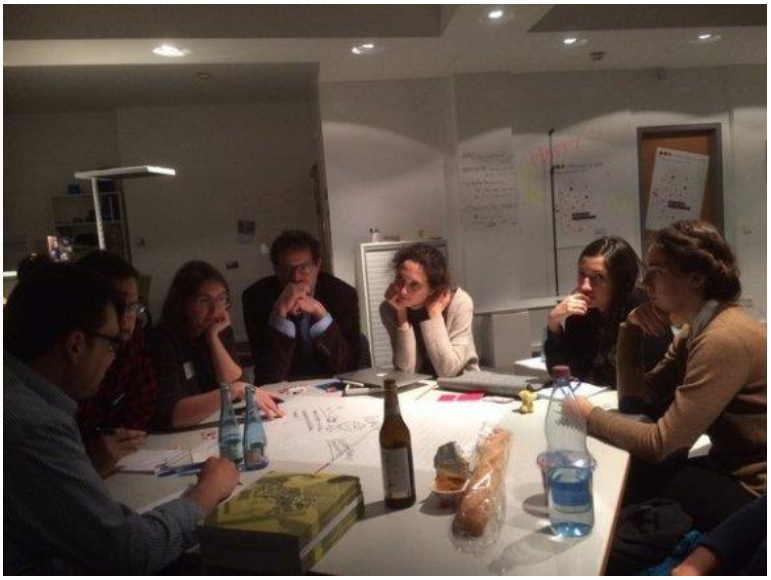
Open Science isn't just a way of practising science by making your research outputs available; it's a mindset, a way of thinking, a way of conducting the entire process of your research.

It also made me fully aware of the 'open community', and despite the fact that there's a global network of 'open champions' out there, the vast majority of academics, or those involved in academia, are still very poorly informed about the importance of open research on the fundamental level of how to practice it, but also on a deeper level of the importance of it. To me, this highlights the importance of developing active networks and communities that aren't just discussing the current issues of research and publishing, but also working to improve them.

Beautiful view of Alexanderplatz in central Berlin for our satellite event

To that end, I was pleased to help organise an OpenCon satellite event after the main show in Berlin, along with Julien Colomb, a neurobiology post-doc and CEO of Drososhare, and Peter Grabitz, an intern with the WHO and medical student. The event was kindly sponsored by ScienceOpen, an open publishing network, and in the end had around 30 attendees, which was nice! A good number for more detailed engagement.

The tweets from the event were storified by Celya Gruson-Daniel thankfully, and contain some nice snippets of the event. There are numerous great quotes and resources within, so really worth checking out!



We kicked things off with an introduction from the Humboldt Institute for Internet and Society (HIIG), an appropriate host with an incredible venue, who simply highlighted that science is trying to solve the needs of the future but stuck in the past.

Our keynote speaker was Prof. Andreas Degkwitz, Chief Librarian of the Humboldt University, who laid some truths bare about essentially how crap our current publishing system is, in that we pay $billions each year to prevent access to knowledge, and that current systems are really less to disrupt that than they are to add an extra cash lining to the pockets of profit-driven publishing companies.

This was it for the speaking part of the event! No-one likes to sit down and be talked at for hours about this stuff. We borrowed the idea from OpenCon to have the rest of the event in an 'unconference' style, by brainstorming major issues, or themed groups of issues, that we were all encountering at some point during our time as researchers, and what we could do to actively start combating them.

The three themes we identified were:

1. How to be 'open' and maintain or build a reputation as a researcher;
2. How to build active communities like OpenCon; and
3. What can researchers do that publishers do, and how can we do it better!

I've got a video somewhere with all of the post-group discussion about the potential solutions we came up with, and will post it online soon.

I guess, if I have one take away point from all of this this for researchers, it's to learn how to empower yourself to be the best you can for research. There are numerous issues with the current academic system, from gender inequality to large-scale fraud, and you can't try to

enact change for all of them. But what you should be aware of, and it's what those in positions of power, or at least have the veil of power (like publishers..), don't want you to know: you have the ability and strength to be an 'open researcher', and to help transform academia into a much more transparent and equal environment. All you have to do is do it.

2016

Breaking the traditional mould of peer review: Why we need a more transparent process of research evaluation, LSE Impact Blog.

What is peer review? Fundamentally, it is supposed to be the process where academic peers provide feedback on research through expert analysis and discussion. It is a process of enormous importance for managing the content of the published scientific record, and with that the careers of the researchers who produce it. Peer review is perceived as the golden standard of scholarly publishing and forms a vital component at the core of the process of research communication and the structure of academia.

In the days of the global 'open research' movement, peer review is undergoing a phase of transformation. There is mounting evidence, and an increasingly common perspective, that peer review is less about evaluating research and more about stifling creativity while maintaining the status quo of established networks. There have been numerous opinion pieces and analyses regarding the different aspects of peer review published over the last decade, but one comment that perhaps emphasises the current evolutionary trend is that peer review is a "model that simply may have run its course given societal and technological change."

At ScienceOpen, we are attempting to take advantage of, and spearhead, this transformation through a system of transparent, community-driven, public peer review. Research communities are the best placed to evaluate research, and this can only be achieved by providing a platform to enable a process of transparent, self-regulating, peer review, where knowledge sharing is encouraged, valued, and rewarded.

There are four core messages that underpin the peer review process at ScienceOpen, each one with a fascinating history of discussion and development.

1. **Getting credit for peer review**

A recent survey found that a majority of researchers would prefer greater levels of feedback and acknowledgement for their work as referees, especially from their research institutes. For this, the peer review process would have to become de-anonymised (see point 2) to enable a reward or recommendation system.

At ScienceOpen, we value referee reports as a fundamental and integral part of research. By making reports open, research becomes more of an evolving dialogue. To facilitate this, we make all of our referee reports publicly available through use of a Creative Commons attribution (CC BY) license. We combine this by supplying DOIs to all reports, so that they become fully citable, re-usable, and formally recognisable as research outputs. Personal review histories can be used to supplement academic profiles or CVs, for example, by adding them to ImpactStory profiles.

2. **To sign or not to sign?**

The quality of peer review has been shown to be influenced very little by whether or not referees sign their reports. The only possible negative effect of removing referee anonymity is that they become more likely to decline to review. But why might this be?

Many researchers, particularly those earlier on in their careers, feel that by being overly critical (which some would call 'thorough'), they might find themselves on the end of a backlash from senior researchers. That such a fear runs through academia is quite disconcerting: we should expect that constructive feedback on our work is well received. Furthermore, retaliation in such a manner represents a serious case of academic misconduct, and by providing transparency into the peer review processes, such cases, should they ever occur, can be dealt with.

To that end, we see transparency through signing referee reports as a mechanism for accountability, for both authors and referees. At ScienceOpen, we expect peer review to be conducted in a professional, civilised, and courteous manner. Through this, we expect the quality of the entire research communication process to increase. By signing reviews, additional context is gained into the process and, perhaps more importantly, recognition and credit can be distributed accordingly.

3. **Referee reports as re-usable outputs**

One main aspect of open peer review is that referee reports are made publicly available after the peer review process. This underpins the idea that peer review is a supportive, progressive and collaborative in order to continuously assess the quality of research and transfer knowledge. By opening up reviews' inspection, a further layer of quality control is injected into the review process.

In 2000, when BioMed Central launched, it didn't take them long to innovate by publishing both the reviewer names and history alongside published manuscripts in the medical journals of the BMC series. Since then, newer journals like PeerJ adopted a system where both the reviews and the names of the referees can be optionally made open. The Frontiers series also publishes all referee names alongside articles.

ScienceOpen supports open peer review primarily through a post-publication system. Each article we publish is open to two layers of evaluation: (1) a formal peer review process that requires a minimum of 5 publications attached to a user's ORCID account to sustain a level of expert review; and (2) a recommendation and commenting service open to all members to encourage early career researchers and other members to contribute to the evaluation of scientific research. By employing this dual approach, we ensure that peer review operates fairly and publicly, and also maintains the integrity and reliability of professionally conducted peer review by the expert research community. By combining this with open licensing and assignment of DOIs, referee reports are fully open to public and expert scrutiny, and are available to further scrutiny, re-use and sharing.

4. **Post-publication peer review to the rescue?**

Several venues have adopted post-publication peer review, based on the adventurous principle that all research deserves the opportunity to be published. Here, the filtering system via peer review occurs subsequent to publishing, and inbuilt systems for post-publication peer review now exist at RIO, The Winnower, F1000 Research, and ScienceOpen.

Criticism of research does not and should not cease simply because research has been singularly verified by traditional peer review. Articles submitted to ScienceOpen are not pre-selected based on any subjective estimate of their perceived impact – we prefer to let research speak for itself. But perhaps more radically, ScienceOpen now offers the same post-publication peer review tools for over 11 million articles on the site. This means that however and wherever pre-publication peer review was carried out, the discussion can continue on the ScienceOpen platform. What better way is there to get credit for sharing your expertise with the scientific community in the form of peer review?

Ultimately, we see peer review at ScienceOpen as a much cheaper, legitimate and unbiased, faster and more efficient alternative to traditional methods of pre-publication peer review. We believe that by adopting a more transparent process of research evaluation, we move one step closer towards a fairer and democratic research process.

Did we just write the most 'open' paper ever..?

It started off in the pub. It always does.

At an 'Open Science Meetup' in Berlin, held in the basement bar of a local brewery, one of the attendees asked us all a simple hypothetical question: 'If I was a research funder going through our budget and saw that we were spending millions on Open Access (OA), how would you justify that expense to me?' You might think people attending an Open Science meetup would have all the answers to this. Heck, even I thought I should be able to answer that! But we actually failed. Each of us made our individual cases, and we failed. Our answers were

incoherent and lacking in convincing evidence. I couldn't even convince myself at the time, and would like to think Open Access is one of the things I know a bit about.

And when you think about it, it's a very good question. I bet every one of you could give me an answer to this off the top of your heads. Something about OA increasing citations, or being good for copyright, or because access to knowledge is a human right, or how it saves money, or because your funder told you to, or whatever. But how do you make a convincing, comprehensive, evidence-informed answer to this question? It's difficult.

So I took the same question to OpenCon in Brussels, an event for students and early career researchers to spearhead the 'open movement'. Everyone I asked failed there too. I pretended to be an impartial funder, and asked the OA advocates present to justify OA to me. And we all failed. Small chunks of useful evidence, but overall incoherent, and underwhelming. This little experiment told me that there's too much varied information, and too few of us who are well-informed enough, to have consistently reasonable, progressive, and evidence-based discussions around OA. I want people to be as well informed as possible about the issues, so that we can have reasonable policies, rational discussions, civil debate, and progressive decision making in the scholarly publishing ecosystem.

So how do you fix this? The world of 'open' is complex and multi-dimensional, with evidence mixing with anecdote, fear combating against data, and misinformation blending with reality. If OA was a simple issue, we'd have resolved it already. The fact remains that the global research community remains largely disorganised with respect to OA, as some like Richard Poynder have pointed out recently*. The reasons for this are likely as multi-faceted as the problem itself, but one point in this sticks out: OA 'advocates' need to take responsibility for the 'open movement.' I wrote a bit about this and accountability in a previous post here, and this is very much a related issue. But part of solving this issue entails equipping ourselves with sufficient knowledge to make the case for open.

So, we wrote a paper. I started it after OpenCon, and put out a public call for contributors through my social channels. Anyone could join at any point. Initially it was just a Google Doc where people could contribute sources, but then I shifted it to Overleaf, a public collaboration platform that uses latex and a version control system to seamlessly integrate contributions from multiple authors at once. So, it was an entirely open process, and a cadre of awesome people joined me. Mostly PhD students, but also a librarian! Each contributed their own perspectives, and watching the paper organically evolve was a magical experience.

I set out to 'make the case for open', and it ended up being a multi-dimensional critical review with contributions from around the world. We ended up discussing copyright law, issues with OA in the 'Global South', innovating beyond traditional publishing models, the cost of OA, and the need for OA in fuelling society, the global economy, and research. People offered comments on Twitter, via email, and on annotations on PDF versions of the article as it was being written. The process was open and dynamic, and it totally rocked!

And we ended up with something I hope you all think is pretty awesome, and which I hope will become a valuable resource for all involved in OA discussions. It was published with F1000 Research, with the submission taking about all of 5 minutes with Overleaf's integration. It was accepted after about 2 days with a light copy edit, and published after being typeset about 9 days after submission. And as part of the Future of Scholarly Publishing channel, it was free too! (Why isn't this the normal process for publishing, again?)

At the moment it's awaiting formal peer review (F1000 Research uses a post-publication system, designed for open and rapid research communication. Again, awesome.). In the meantime, commenting is strongly encouraged! We've already been 'Mounced' in the comments, and I'd love more feedback. There are 5 referees looking at it already formally (yikes...), but that's no reason why we can't have everyone's opinion, thoughts, and expertise influencing this paper. I'll have to save a breakdown of the key points for another post, as this one is already hella long, but in the mean time we would all love any feedback (positive or negative, irrespective of who you are or who you work for), and if you could share the article with your friends and colleagues that'd be just swell.

We are stronger as a community if we take the responsibility to equip ourselves with the knowledge required to advocate for change.

So, the final question is, is there a case for Open? You're damn right there is (citation needed).

*I don't agree with Richard on all of this, but he makes some pretty insightful points.

Why did I choose those journals to publish in?

So regular readers of this blog will know that I'm a pretty big fan of open access (OA) publishing. I wouldn't call myself a "self-proclaimed OA advocate" as some seem to use pejoratively against me, but I support the principles of OA: free, unrestricted access to research for everyone. To that end, during my PhD I promised that every paper I published would be made OA. As a NERC funded student in the UK, this means I was in the fortunate position that the government had given the Research Councils UK (RCUK, which NERC is part of) millions to cover the 'transitional costs to OA', thereby alleviating any personal financial burden I might have had in pursuing OA.

What I want to provide here are reasons for the choices I made of where to publish in order of time throughout my PhD, and the associated costs with that. Indicated costs are the APCs, or article processing charges, unless stated otherwise.

Justification, or not...

1. PLOS ONE. When I first heard about OA during my second Masters, it seemed absurd to me the way the current system worked. Why would I *not* want my research to

be available to be read by anyone? PLOS ONE was the first OA journal I heard about, and I pledged that my first paper would be with them. And it was! Some of the work from my Master's thesis. Cost: **$1350**. Paid by: Imperial College London (via NERC). Also available via my institutional repo. Almost two years later, this paper is still getting media coverage!

2. PeerJ: At this time, PeerJ didn't have an impact factor. I wanted to show that it was risk free for junior researchers to publish here and explore new publishing models, so I did! Despite one colleague saying that "It doesn't count" because it didn't have an IF (what a lovely sentiment...), I still think it's a good piece of work. Cost: **free**. Both me and my co-author got fee waivers; him for peer reviewing for PeerJ, me for commenting on another article. Also available via my institutional repo.

3. Biological Journal of the Linnean Society. I was brought on last minute during the review process for this one as a croc specialist (note that at this time I hadn't actually published on crocs, and this was known purely through Twitter!), and had no influence over the publishing venue. This paper formed part of a special volume, and I thought it was OA (it seems to be free at least from time to time), but I think is now only freely available via ResearchGate, Academia.edu, and I thought it was available through my repo but apparently is not, which I will fix as soon as the system doesn't return errors. Cost: **free** (not free at source) [edit: fixed now, took about ten minutes tops].

4. Zoological Journal of the Linnean Society. This was a joint choice between myself and the co-authors based on the suitability of the research. Cost: **$3600**. Paid by: Imperial College London (via NERC). Thoughts? I have no idea what that APC went on. The type-setting and minor copy-editing were no different than at PeerJ, and the process was considerably slower. Also available via my institutional repo.

5. Nature Communications. A choice beyond my control by the lead authors of the study. Originally submitted to Nature, and rejected without review. Cost: **$6000**. Paid by: Imperial College London (maybe through a dedicated library fund). Again, the actual publishing process to me did not seem any different from any of the other journals. The peer review quality was also about the same, with a high level of constructive feedback from referees. Also available via my institutional repo.

6. Biological Reviews. A review paper. The only other journals which accept review papers in my field are operated by Elsevier, a publisher I have personally been boycotting since around 2011 along with more than 15,000 other researchers. This paper originally got rejected based on some very poor reviews (as in, very low quality), a decision which we appealed and was overturned (thanks to the Editors!), and subsequently the paper was handled much better by the referees and Editorial team, and was accepted with minor revisions. Cost: **$3600**. Paid for by: Imperial College London (via NERC). Available via my institutional repo.

7. Proceedings of the Royal Society B. I went for a 'mid-tier' journal with an OA option as the research was firstly pretty cool, and secondly intensively analytical. Cost: **£1700**. Paid by: Imperial College London (via NERC). The payment for this was a mess. I got invoiced by both the Royal Society and Imperial College, who kept adding VAT even though that had already been included. Eventually resolved, but I kept thinking, why do they both keep asking me?! The only communication needed to be between the publisher and the payer. Again, production no different from any other journal. Faster process than Wiley. Available via my institutional repo.

8. Zoological Journal of the Linnean Society. In press. A highly specialised article about fossil crocodilian taxonomy (atoposaurids, for regular readers!). This journal also has unlimited page lengths for submissions. Why did I choose this instead of PeerJ? The subject speciality, I think. Was it worth it? Nope. Especially as Imperial College have a deal with PeerJ for free publications. Seeing as I knew how much it would cost, this was a bad choice. Available via my institutional repo, but embargoed until the year 10000 (not even kidding...). Cost: **$3600**. Paid by: Imperial College (via NERC).

9. F1000 Research. In press. Written using Overleaf. Submission took about 10 minutes. First decision took about 36 hours (acceptance). Currently being typeset about 3 days after submission. I cannot think of any reason why not to pursue this system more in future, except for limitations on venue choice (but you can directly submit to pre-print servers, PeerJ, etc). Cost: **Free**! (part of a special themed collection).

10. Nature Communications. In review. Because this is the pinnacle of my PhD research, and my supervisor decided a 'high impact' journal would be best, given that the work is pretty awesome I originally wanted to go for PeerJ, to not be constrained by word count. Decided in the end to compromise by having a lengthy supplementary methods section. Potential cost if accepted: $6000.

One thing I don't get either is how there can be a fixed price for highly variable items. Why is a 10-page paper the same cost or higher than one with 100 pages? What is the difference in the actual cost of production? APCs seem to be almost arbitrarily drawn out of a hat, and in every case, it is extremely unclear what is being paid for in terms of services provided. Note also that costs advertised on publisher's websites do not include VAT, so for UK researchers whack an extra 20% onto those APCs.

Does open access just create another form of inequality?

In the UK at least, we've created a system of 'OA privilege' now, where a cohort of junior researchers such as myself are in fortunate positions to publish OA almost wherever we want. Students not in such a fortunate position with less or zero funding will find themselves either constrained in where they can publish OA, or finding that their wish to publish OA is impossible based on the available options. While most major funders, especially those in the

UK, now have funds to support OA publishing, this does not extend to all researchers (for example, those who are self-funded, or from foreign organisations), and we have now allowed publishers to replace one unbalanced system (only the privileged can read), with a different one, in which only those with appropriate funds can publish. While there are many waivers in place to reduce this imbalance, it is clearly far from a perfect system.

This of course all refers to 'gold OA', where papers are made freely available at the point and time of publication. While statistically around 70% of journals do not charge an APC for this service according to the DOAJ (Directory of Open Access Journals), almost all of the big publishers and journals do, and those are the ones junior researchers will usually be more compelled to publish in. What is important is not that there are options available, but that those options are constrained based on financial privilege.

No one has ever said publishing should be free, it is clear that costs are involved. But the question is how much should we pay. It is everyone's responsibility to make sure that we get the best value for money in publishing, especially when we're talking about using taxpayer's money. The lack of transparency in APCs, and the total lack of control over how much can be charged and who is willing to pay, or who has to pay, for them does little to resolve this.

Accountability in open access publishing

Those numbers up there are firstly quite variable, and secondly extremely high. However, not a single penny of it was paid from myself. As a government funded student, almost every APC here was paid for by the taxpayer. Did I give them the best value for their money with each of my choices? No. Were the choices I made a compromise between wanting to have career success (by publishing in 'well recognised' journals) and wanting to publish OA. Yes.

So, I think this is a problem for two reasons. Firstly, it means there is zero accountability for researchers in what they spend on OA, as the money is only being indirectly channelled through them. And secondly, we're putting researchers in a position where if they want to publish OA, and publish in well-established journals in the hope this will influence their careers (which strong evidence indicates it will), then they have to find often large amounts of cash to fund this.

Now, this isn't a problem with OA itself. This is the problem of treating something that started off with an ideological basis, that research should be freely available to all without restrictions on re-use, as a service that many publishers leverage a fee for. And I'm not picking on any publisher here, although it is clear that there are some who are exploiting this financially. I'm saying this is a problem with the system we have allowed to be created around OA. As others like Björn Brembs have pointed out, we could publish the entire research outputs of the world OA for a fraction of the present cost we pay, but for some reason we don't. And I think one of the main reasons for this is because no one is accepting responsibility, or being held

accountable, for letting this system perpetuate. It's no longer a 'publish or perish' culture. It's a 'publish, pay, and perish' culture.

But the responsibility to initiate and fight for change shouldn't be on researchers like myself and my junior colleagues, those in the riskiest position at the beginning of their careers, with the most to lose and the least to gain. I take full responsibility for my choices, including the bad ones, but I feel that we shouldn't have allowed a system like this be created in the first place. In light of this, coordinated change should be coming from the top of academia. From the tenured professors, from the senior admin positions. But nonetheless, I think all researchers need to have a look at how they can improve the system of scholarly communications and OA, and also how they have contributed to it reaching the broken state it's in.

We need to take responsibility for our publishing decisions, and question what the motivations behind them were, and whether this is in line with the goal of research: to increase global knowledge, and maximise accessibility and re-use of information.

I broke the system.

You should always follow your heart in research, Interview with Editage Insights.

Let's talk about your life as an early-career researcher. Why did you decide to transition between disciplines during your academic journey?

I originally started university as a planetary geologist! During my second year though, I was seduced by the dark side of science (dinosaurs) thanks to meeting Prof. Phil Manning, and switched to mainstream geology in order to take his class. After that, I was set on getting a PhD in palaeontology, but realized that a purely geological background wasn't sufficient for much modern palaeontological research, as much of it is geared towards biological sciences. So, I made the treacherous switch to the life sciences for a second masters which, combined with my affinities for rocks, formed the perfect basis to launch into palaeontology!

How easy or difficult would you say is it for researchers to change disciplines?

Hmm, that's a good question. I think the level of difficulty would depend on why you would want to switch, how related or integrated the two disciplines are, and what sort of opportunities are available. There are no rules here, but you should always follow your heart in research. The difficulty will always be discovering what you need to do to give yourself the best opportunity to do what you love in the future, and sometimes making a big change is good for that. I would also say that a lot of it is down to your mentality. You have to be open to the possibility that you might be making a big change in your life and stepping out into the

unknown. For some, this will be exciting, and others it might be scary. My advice is to embrace it the change, adapt, and excel.

More and more researchers are taking to multidisciplinarity, either by switching streams or by specializing in more than one discipline during their research. What role do you think interdisciplinarity plays in academic research today?

Research thrives on interdisciplinarity! I can't think of anything more important than collaborating with others in order to expand your knowledge boundaries. For example, modern palaeontology includes aspects of chemistry, molecular biology, geology, zoology, ecology, and even particle physics, so it's super integrative. These are less personal decisions though, I think. Interdisciplinarity isn't about individual choice. It's more about recognising what is required in order to advance the field, which we work on collectively as a research community. By isolating research fields, we neglect to learn from what others are discovering, and that isn't helping to progress anything.

How and when did you develop an interest in science communication and policy?

After my second Masters, I was unemployed for a few months while waiting for an appropriate research opportunity to pop up. During this "down time", I started blogging and using other social media to develop some skills in this arena. I was fortunate enough to get a job in science policy with The Geological Society of London, which was a fascinating experience and, for me, cemented the links among research, communication, and policy. Importantly, it provided me with a completely new perspective on the value of research than I'd otherwise just got at university. In particular, how research interacts more broadly with society – beyond "science for the sake of science". I started my PhD two days after that job finished, and went into it with an entirely different perspective on research than before the position.

I always like to acknowledge my boss Nic Bilham (Director of Policy and Communications at the Geological Society), who while I was at the Society, taught me much about science policy and the value of broad and effective communications, as well as the important role of learned societies in modern research environments. The skills I learned during my time at the Society, and have continued to work on since, have been incredibly valuable to my growth as a researcher. I feel very privileged to have been granted the experience and try to encourage others to develop in these areas, too.

You are currently involved in several activities in addition to core research: writing and publishing academic research papers, blogging, interacting with people from the academic publishing industry, attending conferences, giving talks, etc. How do you make time for everything?

Honestly, it's really ridiculously difficult, and interferes quite a lot with my personal life at times, especially when it requires travel or working in different time zones. However, I believe

that the things I work on are important and I am happy to dedicate as much time as I need to them. For example, I strongly believe that science communication and working to make research more accessible are important, so I spend a lot of time blogging/freelance writing; I also think equal access to knowledge is imperative, so I spend a lot of my time working on things like open access. Things like blogging become much quicker with time as your writing skills develop, but sometimes you just have to go for them when you have time! I try simply just to do things as they come up, and it's quite chaotic at times, but this also means I don't get bored working on the same thing every day! If you believe something is important, then it's worth spending time doing it and committing all you have to it.

You are also a peer reviewer for Publons; could you talk about this experience?

So Publons isn't a peer review platform itself, it's a place to keep a public (or not, if you choose) record of your reviewing activities. I still find it bizarre that some researchers don't want to receive credit for their work as peer reviewers given its enormous importance, and Publons is an awesome solution to help shift that mentality. Open is never an end, but a means, and with peer review, open becomes a powerful way of increasing transparency for accountability, receiving credit, and allowing others to build on and re-use your work. A lot of researchers view peer review as part of their academic duty, and perhaps rightly so, but this doesn't mean we shouldn't receive appropriate recognition for it.

As soon as I did my first peer review, the record went up on Publons. Sadly, many journals believe that they still have authority over how researchers use their reviews, or consider it to be a privileged or private process; therefore, most often, you can't post the actual review itself, although there is a lot of experimentation in this area at the moment. This is quite bizarre to me. How can a secretive, non-publicised, and exclusive process be considered as objective? That's hardly the gold standard we hold "peer review" to be.

I've done five peer reviews during my PhD so far – I don't know if that's relatively high or low for this stage! As such, it doesn't really interfere with my "schedule" too much. I'd like to think I've been as thorough as possible with these reviews, and they have never taken me more than a week or so to perform. All of them are on Publons, too, to the maximum extent of visibility allowed.

At this point, it's impossible to comment on the impact that this has had so far – I do like the concept of Publons as on open record of "services" contributed to the community through peer review, as well as a sign that I'm not afraid for the content of my reviews to be seen. If I'm writing things that I don't want others to see, then I probably shouldn't be writing them at all. Whether or not using Publons will have a positive impact remains to be seen, as I'm still a "science noob"! My overall experience with Publons has been overwhelmingly positive, although some publishers have restrictive policies that vastly lower how we can interact with and use Publons for the good of research.

Could you tell us more about Open Glossary?

So the Open Research Glossary is an OpenCon spin off! Ross Mounce and I were giving a joint talk at an OpenCon satellite event in London about the importance of open data. Afterwards in the pub, someone mentioned that a lot of the terminology we used was new to them and it made our talk difficult to follow. Essentially, what was revealed to us was a language barrier that we had created around the "world of open." So right then and there in the pub, we started drafting a "jargon list" of terms used in any aspect of open research. This ranged from core terms to those related to policy, and those to do with licensing and principles. We built a resource from this using Google Docs so that anyone could contribute, and a list of community definitions that we could adhere to. A while later, we had produced a fairly comprehensive resource, and the Right to Research Coalition were kind enough to host it. Anyone can still contribute to it here, and when sufficient new content has been added we will create a second version.

On your LinkedIn profile, you say that you aim to "strengthen the interaction of academic research, outreach, and policy making in Geoscience." How do you plan to go about doing this?

I do continue to stress the importance of science communication, understanding the policy process and interaction of science, and additional aspects of the research and communication process whenever possible. So, for example, I helped to run the Science Communication Forum at Imperial College, London, where we held workshops and events about important aspects of research policy, such as developments in scholarly publishing regarding open access and open data. I take every opportunity to write about new research, as well as my experiences as a PhD student to expose some of the research process. My work in the policy domain has faltered a bit recently simply due to time constraints, but I do sit on the Geological Society's Science Committee so am happy to help in a small way still. Most recently, my interests have more been about transparency in research, particularly regarding the ongoing development of "open science", and I have spent the last 5 years or so trying to make sure researchers are as well-informed about this topic as possible. Towards the end of my PhD, I also took a position at ScienceOpen, an open research and publishing platform, and have been spending a lot of time communicating the benefits of things like open access, open data, science communication, open peer review, and killing the impact factor!

In a blog post, you mention that, "there are still many misconceptions that the OpenCon community need to work better at". Could you elaborate?

Sure! This refers to open access more generally. There is often an astonishingly low level of knowledge that some researchers have about this still, which I find astounding given how clearly important this is – I mean, we're just talking about access to the world's core knowledge base! To that end, myself and others recently wrote a paper reviewing the evidence for open access in academia, for the economy, and for broader society. I cannot

think of anything more fundamentally important than free and equal access to knowledge for everyone, and hope that this paper, as well as my other activities, are part of a small step towards that goal.

But as a couple of specific examples, the lack of understanding about self-archiving. Many researchers complain that open access is rubbish because it costs too much or the options are too few. Self-archiving is universally free (except for the hosting and maintenance), and using tools like Sherpa/Romeo it becomes easy to know what the possible constraints on it are. Another aspect is when people say that open access costs too much, they seem to forget how much we spend on the current system of providing restricted access to the financially or academically privileged, which comes in at around $8-10 billion each year. We could publish the research outputs of the world for a fraction of that cost and make it open to everyone. The more you know, the weirder scholarly publishing seems, and the weaker the arguments for retaining the current system, or against open access, become.

Other researchers still say that the general public either doesn't want or doesn't need access to research papers: in fact, the last person I heard say this was the Director of Public Relations at a certain major publisher (no names) at an event in Berlin. Such a perspective is arrogant, ignorant, elitist, and does extremely little to break the "ivory tower" conscience that still pervades much of research. That the "public" doesn't need, want, or deserve access to knowledge is, in my view, a despicable and ill-informed misconception, undermines years of global research and effort, and something all of academia needs to work better at combating.

In another post, you write, "we are moving away from a system where impact factors and commercial publishers are dominating the system", yet "Impact factors, whether we like it or not, are still used as a proxy for quality." Could you elaborate?

The impact factor, and with it journal rank, is the bane of academia. Designed as a way for libraries to select which journals their faculty where using most, it is now used as a lazy, cheap, and rapid way to evaluate researchers and the research they do. It is blatantly ironic that researchers, the supposed seekers of knowledge and evidence, fall back on to such a weak, nonsensical, and misused metric for something so important as defining the structure of academia. Some evidence shows that it can't even be reproduced, and is essentially "brought" through negotiations between Thomson Reuters and publishers, and that using any form of journal rank for assessment is basically poor academic practice.

More recently, I proposed a series of things researchers and institutes could do at different levels to help kill the impact factor and move to a better system of evaluation. After much discussion, it seemed that killing the impact factor simply isn't enough; even worse, it could be risky for researchers to stop using it (or playing the "impact factor game") when those who are evaluating them still are! Right now, all I know is this: We are losing some of our best and brightest researchers to the impact factor. These researchers start their careers with the intention of producing the best research and communicating it as widely as possible to effect

real change, but become disillusioned when they realize that academia is now little more than impact factor hunting for careerism, and that it matters less about what they publish than where they publish. It's not good for science, and it's not good for scientists, and everyone in the scholarly ecosystem must accept at least partial responsibility for the continuing misuse and domination of the impact factor, and be accountable for not finding better structural alternatives.

Do you think the academic community is open to alternative models of peer review and publishing? And is research published using alternative systems taken as seriously as its conventionally published counterpart?

So, one thing we need to recognize is that the global academic community is incredibly heterogeneous. It doesn't act like a hive mind, but is built up of smaller communities that are about as hyper variable as can be. As such, opinions on emerging or ongoing changes to the scholarly communication process are always highly diverse, and often vigorously polarized.

10 years ago, open access publishing was laughed at. Traditional publishers said it would never work, researchers viewed it as low-quality garbage, and there was relatively little funding for it. Now, we have a global system of open access policies and mandates, and those who were strongly opposed to it originally are now recognizing the vast benefits of it for various reasons. So, one thing academics always want is evidence – "show me the system works." It took open access a while to get that far — to show it could be more efficient, higher quality, cheaper, and generally better than the traditional system, and also be a sustainable business model. Now many academics publish exclusively open access, funders have mandated it on massive scales, we're seeing increasing innovation in publishing (mostly from academics themselves), and some publishers are generating additional profits from it. But the change was slow, and agonizing, and required painstaking negotiations over many years to get there. There are still massive debates around things like "pre-prints", effectively instantaneous publication prior to formal peer review. Some research communities like High Energy Physics and Mathematics have been largely doing this for decades (this is actually the reason the Web was invented!), but those in the Life Sciences are generally lagging behind for one reason or another. But things are slowly changing, and it seems as though some researchers are happier to experiment with new forms of publishing and communication. So yes, some are generally open I would say, but many are still conservative and it depends on a huge combination of factors from social norms and practices, to policies and option availability. The biggest problem is that often the risks associated with this can outweigh the potential benefits, and no researcher should be put in a position where they have to choose between being open and their career.

Some of my colleagues said at the beginning of my PhD, "There's no way you can publish exclusively OA and maintain a research career" (I'll let you know how this works out in the future.) I still remember when my first paper was published in *PeerJ*, a senior colleague said,

"It doesn't even have an impact factor, so it doesn't count." That hurt. My second was in *PLOS ONE*. Another senior colleague said that "It doesn't count, it's not even peer reviewed." This was in 2014, so not too long ago. Both of these comments stuck with me for multiple reasons. The second, because it's just outright wrong, and revealed a fundamental lack of understanding regarding OA. And the first because no matter how much we change the scholarly publishing system in a move towards new models based around journals, we still haven't done anything to decouple the assessment of researchers (based largely on journal brands and impact factors) from the intrinsic quality and communication of their work. This is the real kicker, and many researchers are now coming around to the idea that it's not enough to innovate in publishing if we don't look at structural academic reform too. Three years after this though, all 9 of my peer reviewed papers are open access, and I was recently lucky enough to win our prestigious departmental award for that. Take that, nay-sayers!

Regarding peer review, it seems that a lot less is being discussed about this. As part of the Mozilla Global Sprint, we began drafting a paper about what some potential future models of peer review might look like if we embraced the power of the Web better. This is fairly progressive and imaginative, but generally, I think that academics are resilient to changes in peer review. Researchers in senior positions have done well from the current system of peer review and traditional publishing. That much is obvious, otherwise they wouldn't be in those more powerful positions. Therefore, it is not surprising that those academics look unfavourably upon disruptions to that same system. The problem is that it is the more senior academics who are in the positions of power, and have the ability to influence not just larger scale changes but also hearts and minds. This becomes even more apparent when you talk about open peer review. Almost every junior researcher I speak to is terrified of it. And all for the same reason: "If I sign my name to my review, then a senior researcher might negatively respond to that, and the backlash could harm my career." This is abuse of power dynamics, and has nothing to do with peer review models itself; it has to do with the fact that we let senior researchers control and distort a system without any accountability. So, there is this constant battle between entrenchment and the status quo, on the side of those with much of the power, and those who perhaps have a better vision of peer review and scholarly communication in general. The problem is that those who have the vision for change are often those most at risk, such as students, whereas those who are entrenched in the system have little incentive to help change it because it has been beneficial to them. This is one of the main reasons for what I think a lot of people refer to as "cultural inertia" within academia.

How important is it for researchers to inform themselves of current trends in science communication and issues in science policy?

Researchers are paid to do one thing: research. This will always be their key priority, but to do so unaware of the evolving world around them is folly. I find it quite dismaying sometimes how poorly informed researchers are about things. Like at Imperial College (and further), many of my colleagues didn't know that there is a new national open access policy in place,

that we have dedicated open access funds, or even an institutional repository. Many hadn't even thought about issues to do with publishing oligopolies, the fact that not everyone enjoyed the same privileged level of research access as they did, and the amount of money we were losing to publishers each year. The number of times people would say "Well I have access to the research I need, so what's the problem?" was infuriating. Many wouldn't know how the impact factor is calculated, or how or why to share their research data, and various other aspects of the changing scholarly communication ecosystem. But there was usually a willingness to learn more, which was awesome. And always people actively working to make it easier to learn, to advocate for these changes, and build communities around them – this is why I love OpenCon so much!

However, I will concede that there are several layers of failure here. Firstly, for researchers to personally equip themselves with the knowledge about various aspects of scholarly communication; secondly, for universities and research institutes not to provide any training in this (after all, it's a complex and rapidly evolving domain); and thirdly, for research communities not to discuss these things more openly at a higher level, and to make sure that what we are doing is always in the best interests of the public and the communication and dissemination of research.

There are huge debates that affect all researchers and their work happening all the time. For example, copyright reform in the EU, along with proposals to have all EU publicly funded research open access by 2020. Many researchers I speak to don't even realize they have no ownership of their work once they sign their copyright away to publishers. Revelation of this simple fact is often met with utter bewilderment and disbelief. And you bet publishers will be lobbying hard to make sure these systemic changes happen as much in their interests as possible, but researchers can do nothing unless they firstly equip themselves with the knowledge they need to understand these changes, and secondly have a platform to make their voices heard and affect change.

If you could change three things about research communication/science policy, what would they be and why?

We often talk about "open" as if it has value in itself. This is only a half truth, and the real value comes from what openness gives you, which depends on the context. In science policy, I would love to see more transparency in the decision-making process as a result of being more open. What evidence was used? Where? How was the conclusion reached? What conversations/meetings were had that haven't reached the public record, and what was discussed at them? This is part of transparency for the sake of democratic accountability, and an important part of social policy making to me. For many, science policy is like reading the conclusions section of a paper, but the methods, material and discussion sections are all completely absent!

I would like to see more policymakers and funders acting in the best interests of the commons. For example, if you have a choice to make between preserving the unsustainable profit margins of some scholarly publishers or offering better value for money elsewhere, then you take the second choice. When you have some publishers making 40% profit margins of at least partial public funding, and largely through prohibiting public access to knowledge, you know something is massively wrong with your system. Changing this certainly includes the development of a robust scholarly communications infrastructure (which people like Björn Brembs and Geoffrey Bilder among others are great advocates for) — essentially crafting an efficient, default workflow for the entire research process, including communication. If governments fund this, we could save billions each year and re-inject it into research instead of wasting it on profiteering publishers, and the relatively low-value high-cost services that they offer.

Most of all, though, we need a complete and massive-scale overhaul of our assessment system. It is completely unacceptable that in the digital age we are still defaulting to lazy and inappropriate assessment criteria for whatever reason. This is actually related to the second point, in that if you build an infrastructure where communication of research (i.e., ~95% of the value) is decoupled from both the concept of journal prestige and the traditional publication process, then we should see a movement away from poor evaluation criteria (i.e., those which are journal-based). In almost every discussion I have with junior researchers, this is what it comes back to. Some are being put off doing science openly, or even correctly, because they fear they will be firstly punished by the publishing system, and then penalized by the research evaluation system. It is outrageous and bewildering that we haven't managed to come up with a practical, systemic solution to this.

Where do you see academic publishing 20 years from now?

I suspect for one that we will see an almost totally decoupling or deconstruction of what "publishing" is. By that, I mean the process will be streamlined to such an extent that the legitimately valuable services such as copy editing or type-setting are automated or outsourced for incredibly low prices, as some journals are already showing (i.e., by embracing the power of the internet and technology). Peer review becomes an open, constructive, and transparent community-driven process, similar to how we see people use Stack Exchange. Paywalls are non-existent, and we lament that they even once existed. Traditional publishers still exist, but now offer overlay or data-oriented services, because we've created a system where the communication of research is entirely independent of publishing. Instead of publishers and journals picking which papers they should publish, they should be paying for the privilege of getting to publish that work. I see copyright reforming such that it is academics who retain ownership of their work, and not being used as an income-engineering tool for publishers. Evaluation is done by the community, for the community — for example, a simple system like Stack Exchange where the value of content is based on community-wide assessment and how that content is re-used and digested. Instead of researchers being forced

to create crudely written papers, we see a decoupling of the "paper" itself – data collectors publish data; communicators define the context; statisticians analyse the data; machines perform massive-scale meta-analysis on the global knowledge corpus, and we ultimately create a platform or series of platforms that leverages what is eminently capable with modern technology.

Of course, none of this will probably happen, because academic culture is the definition of inertia. But we can and should be optimistic, and strive every day to make sure we are doing research for the good of the commons, and not to line the pockets of a few greedy corporations.

Would you like to offer any other advice to early-career researchers?

I can share some of the things I have learned as a young researcher:

- Develop skills beyond being a researcher. Push your horizons, talk with people beyond academia, and take on as much experience and perspective from others as you can. Listening is so much more valuable than speaking.
- Find something that is important to you, and dedicate your time to doing it. And if you love it, then give it your best!
- Also, no matter what you do in academia, you will always end up getting on someone's bad side. Usually this means that you're just challenging the status quo, so don't be afraid of rising to challenges or meeting resistance, but always be as diplomatic as possible.
- Find existing networks who are working on similar things to your interests! Via social media, the power of communities within science has never been more visible, and there are always people out there for you to learn from, collaborate with, and help out if needed.
- Never be afraid to ask questions: this is how we learn and collectively progress. If someone makes you feel stupid for asking an "obvious" question, that is the sort of arrogance that science could do without — we should all be fully aware that we never stop learning.
- Finally, sometimes it does get a bit much alongside all the other things you have to do as a student, so the best piece of advice I can give is learn how to say "no," and don't bite off more than you can chew! Things will always get done eventually by someone, and grad students especially are always over-burdened and over-pressured, so you have to manage your time exceptionally well.

Why you should publish the shit out of your PhD as early as possible.

I think the title for this one is pretty self-explanatory. I've now submitted my thesis and have a viva date set, which apparently means that I'm now self-entitled enough to feel like I can hand down advice as if I've been given a gift of incarnate knowledge and wisdom from the gods of academia.

Irrespective of what we want academia to look like, the reality of being a researcher is still this for the vast majority: If you aren't publishing your work, you don't exist. There will be exceptions, but this is the norm and the reality. Publish or perish is still the *raison d'etre* for many junior academics. If you're not playing the game, you bet your ass your friends/colleagues/competitors are. So, to not do so is a bit daft.

So, my advice is simply this. If you have something that is publishable, or can be adapted into something publishable, or can forge collaborations early on that lead to publication, do it. Jump on it, commit to it, and finish it. My personal reason for publishing a lot during my PhD was to give a middle finger to 'colleagues' who said you cannot do open access things/science communication/high impact publications (whatever they are) etc. all at once during a PhD. Well, it is possible. You just have to work pretty damn hard, be focused, dedicated, and think strategically. Work hard, play harder, was my PhD ethos.

So, what are some of the advantages of publishing early?

Shiny papers! Having a publication record of any sort as early as possible can only have advantages for you career. It looks good on paper. Your work can get cited, shared and re-used, people know what you do, and the quality of your work. You contribute to the published scientific record. You show that you can commit to do something that is pretty fucking difficult to get at first, but follow it through and complete the task. Trust me, it gets easier with time and experience. And you'll never know what you're capable of unless you jump into the ring and give it your best shot. Each one of these things screams 'employ me', if your goal is to stay in research. I know this is different for different fields, but industry isn't exactly crawling with jobs for palaeontologists these days...

One of the major advantages for me has been peer review. Of the more analytical papers I've published, peer review has helped by pointing out data issues, potential analytical steps that could be added, and different interpretations of the results. All of this has invariably influenced the direction of my research, the quality of the results and discussion, and the strength of my PhD research. Peer review can therefore be seen as simply having an extra few sets of extremely well-trained eyes giving your work quality assurance before you've even started your thesis. And that is truly invaluable. It's not about pointing out holes in your work; it's about making sure it's as complete and well thought out as possible. And there's nothing wrong with embracing that sort of constructive feedback.

What are some of the potential disadvantages?

You might think that if you're publishing early on, you haven't had enough time to let the research mature in your mind. To think about all the angles, what might be missing. Well, thankfully this is sort of what the peer review process is for. And co-authors. Publishing is rarely a solitary task these days. As a grad student, almost inevitably you will have at least your supervisor publishing along with you. It is highly unlikely they will let you attempt to publish under-cooked research, especially as their reputations will be at stake too.

There are more important things to be doing than publishing. Like more research, or writing your thesis. Well, if you're on track to publishing during your PhD, then your research is likely to be going rather well already. And you don't have to dedicate all of your time to one thing. Got two screens? Awesome, science the shit out of some data while editing a paragraph of a paper. Code compiling? Sweet, draft the hell out of that figure. Use your time efficiently, and commit to kicking ass. But really, writing a paper can be nice to break the monotony of everyday research. You will get faster with time too, and it helps you to maintain a diversity of tasks to keep your mind occupied through the day.

And the thesis. Well, if you've written a paper, you can either just use that as a chapter/part of a chapter, or adapt it into one. Papers are supposed to be concise and succinct, but a thesis allows you to elaborate and get creative. Keep a notebook or something, and simply extend what you put into a paper and adapt it into a thesis chapter. Add any additional data, and bam, there you go. There is no 'papers or thesis' argument if you simply think through the process early on. Discuss it with your supervisor, point out potentially publishable items as early on as possible. Be strategic with your time, and your research and writing process.

Why I will never publish with Wiley again.

So, anyone who knows me knows that I'm not the hugest fan of large, commercial publishers, and for a variety of reasons. I want to tell you of a recent experience though with Wiley, one of the most prominent (profiteering) research publishers out there. This experience, in combination with numerous other factors, was so infuriating, that I considered launching a 'Cost of Knowledge' style boycott against them for it. Instead, I'm just going to lay out the account, make some suggestions, and let you all make your own decisions.

Recently, I published a large chunk of my PhD research with a Wiley journal, the Zoological Journal of the Linnean Society. Nothing too ground-breaking, but a loooot of work. It's Open Access, of course, and I was charged $3600 for the privilege of them making a PDF for me, and a nice bit of journal branding. Thanks, Wiley. As Wiley make around a 40% profit margin, about $1440 of this fee went straight to their lucky shareholders, which must explain that nice, warm feeling you get when paying...

Here are the three main levels of frustration during the publication of this paper.

The peer review process

Peer review is designed to test the validity of your research and suggest ways in which it might be improved. In the case of this paper, it took around 3 months for me to receive about 5 lines of text from a single anonymous referee, that contributed extremely little to the content. It did not review my data, my analyses, my conclusions, my discussions. It was not what I expect of a thorough peer review process. I cannot publicise the review itself or my response, and realise I am sort of shooting myself in the foot by saying I don't think my research was appropriately tested (read it and see for yourself though, all the data etc. is open), but this was not what I deem to be a sufficiently rigorous process. One can only imagine how often this is the case for published papers. My apologies here to the referee who I imagine did their best, but this is a problem when you have a closed, anonymous system, in which editorial decisions are based often on incomplete information. The paper was accepted almost exactly as it was originally submitted on January 19th.

The production

After acceptance is when things get really bad. The proofing stage was a mess. I had to go through a series of tedious back and forths with the production team to simply resolve discrepancies in line spacing in a table. We're building machines to recreate the fucking universe, and this publisher can't figure out how to resolve a line spacing issue in a table. I mean, come on. All I could think of was why am I putting myself through this? What's the point? What is this helping to accelerate? And why am I paying $3600 for this??

Now, this particular journal does 'Early View' publication, in which a paper is made available online before it is put into a bi-monthly issue. Which is great. But the weird thing about this journal is that it no longer prints issues, and is online only. So why do issues exist? I have no idea. To preserve some sense that the journal still matters, and has to hang on to its paper legacy in order to have any prestige?

Whatever the reason, this is actually very harmful to publication times. In our paper, we identify a new genus of extinct crocodyliform. The Production Editor informed me that because of this, the 'Early View' option would not be available because of the rules regarding the formal naming of new organisms. This is important, because when you give priority to a named species, it is usually the author followed by the date of naming. So, for example, it would be *Sabresuchus* (Tennant *et al*. 2016) in this case. But also, this can create conflict if the early view version is published in 2016, but not formally put into an issue (remember, which is not needed for online only journals) until 2017. The production editor told me this conflict would probably not happen due to the length of the backlog (that again exists for no reason apart from the arbitrary division into digital only issues), but that the publication would still need to be delayed by at least 3 months just to be on the safe side.

Fantastic.

The publication

Around 3 months after this decision was made, a colleague of mine published another paper in which the taxonomic changes he made were essentially of the same sort. The major difference though was that this was published in the 'Early View' format, so I was like what's the deal with that? It was exactly the same as what I had done, with an old specimen being transferred to a new genus, and with that genus being given a new ZooBank LSID as is required by our profession (this was clearly given in our paper too).

So why the difference in publishing times? Why had I waited 3 months, delaying release of this research, delaying re-use of this work, and my being able to take credit for it at a crucial time in my career (I submitted my thesis last week...). Well, I asked the Production Editor. They said that the difference was because I hadn't provided an LSID in my paper. Which I had. And was pretty obviously right there where it should have been. Oops.

Most annoyingly, why wasn't I told 3 months ago that this was the reason for the delay? I could have simply told them they'd made a mistake (although why this is my job is beyond me...), and I could have had a substantial piece of research published three months earlier. Do you know what I was told? Sorry, and here it is published. It took no time for the publication to happen (literally minutes), and took three months to delay it for no reason. It was finally published on July 13th. So almost 7 months after acceptance, and 11 months after submission. What did I get for this? A publication, a brand, and an impact factor, all of which add nothing to the research content. Some html, which I could have made myself in no time. Some xml, which is quite nice for machines. A PDF which would have taken 5 seconds to make in Word. Wiley got $3600 of taxpayer's money for this. Do you think that is in any way a fair trade? I got a shit deal, zero value added, major delays to my work and career, and a dent in taxpayers funds in exchange for nothing but raw profiteering and inefficiency from Wiley.

Just put yourself in my shoes. I want to stay in academia. That's why I've strived to publish as much as possible in order to give myself the best possible chance to remain, because I want to disrupt the system from within. This has set me back. By how much, I cannot tell, but it must have, because publications count.

So, what next?

I've said it before, and I'll say it again now. There was no reason for me or any of my colleagues to choose this journal now over, for example, PeerJ. I knew this before submission, so sorry to Pete and Jason and the PeerJ team for not putting my trust in you again. And sorry to those who fund me for wasting your funds inefficiently. I made the wrong choice, and will learn from it, and hope others will too.

Some things you can do as researchers:

- Think carefully about which journal you are submitting to and why. This will rarely be a black and white choice, but think deeply about who it is you're publishing for and why.

- Question publishers and their practices. Call them out for bad practices, and challenge them publicly. We're paying literally billions every year for these services, and they constantly let us down, over and over again. It is unacceptable that we allow knowledge to be held ransom by corporate entities in exchange for this level of shoddiness.

Some things Wiley and the ZJLS can do:

- The ZJLS should cancel their contract with Wiley immediately. They are profiteering by providing poor quality and inefficient systems and delaying the publication of research. Please consider switching to a new, more efficient, and open publishing platform such as Ubiquity Press.

- The ZJLS should realise that by aiding Wiley in their mission to achieve 40% profit margins, this runs almost opposite to their mission as a learned society in making zoological and taxonomic research more of a public good.

- Wiley. Be clearer about your Editorial and production processes. Most of these issues could have been avoided with better communications, and more transparency about the process. I feel utterly let down, and will be advising my colleagues to avoid your journals in the future.

A challenge to publishers to justify embargo periods.

Embargo periods on scientific research are now fairly commonplace. They are sanctions imposed by publishers on different versions of a research manuscript, often termed the author-accepted manuscript (AAM) or post-print, in order to delay public release of those versions. Typically, at this stage, the publishers themselves have had little or no input to the process besides managing the peer review process through volunteer editorial staff.

These impositions now typically exist in the form of embargo policies, in which publishers 'allow' researchers to deposit these earlier versions (still peer reviewed) in a public repository of some sort, but with a delay of anywhere between 6-24 months, typically. This is commonly referred to as 'green open access', although the original definition of this simply required public archiving in a repository without any mention of embargo periods.

So, here's the kicker. These embargoes are applied by publishers in order to avoid putative reductions in subscription income due to such self-archiving. Basically, another way of delaying access to knowledge in order to preserve corporate income, which for some reason

we allow. However, there is little to no evidence to support the existence of such embargoes (see here, here, here, here , here, and here), and especially for this reason.

But why would a lack of embargo periods lead to a reduction in subscription income anyway? Let's just think this one through. We essentially have two competing products. The first is the AAM, which is essentially a word document or PDF that has undergone peer review (again for free), and is available for free. Then you the final version of record, the published version, which has been made pretty, typeset, has the copyright owned by the publisher, and a journal brand attached to it, and will cost somewhere between $30-$40 to download a copy of the PDF per person.

So, the 'logic' here is this. The second version costs so much per copy because publishers have added substantial value to the process. But if this product is so superior, then why would you need to place restrictions on the release of the AAM version? Surely anyone who wants a copy of the paper would see the amazing value add of the publishing process and not think twice about buying the final version?

Well, that's just it. The value add is so little, and the price is so high, that no one in their right mind would pay for the final version, except under unusual circumstances. And publishers know this. The reason embargo periods therefore exist is to stop loss of revenue because the value add by the publishers is completely disparate from the prices they charge for their product compared to the free version.

Embargo periods are an explicit statement from publishers about how little value they add to the process. The longer they are imposed, the greater this is. It's really shooting themselves in the foot, and I am bewildered that this practice is firstly increasing (i.e., getting worse) in favour of publishers (see here for example), and secondly that as a collective academia has not taken a stand yet.

I challenge any publisher therefore to justify the use of embargo periods. If you add so much value to the process, you shouldn't need embargo periods. You should be able to destroy any competing versions of articles easily, right? And the price you charge is clearly a reflection of that.

I welcome an evidence-informed response to this challenge. If one is not forthcoming, I call on policymakers and research institutes to completely ignore publisher-enforced embargo periods, as they are completely arbitrary and unjustifiable.

Shit I learned during my PhD.

Doing a PhD is one of the greatest trials you will ever experience in your life. It is physically and mentally gruelling, you will be challenged and pushed to the limit every single day, and

the pressure levels are so high they will bust you right into the sixth dimension if you're not prepared or strong enough.

So yeah, they are not for the faint of hearted. That is, if you want to succeed by pushing yourself to the limit, excel in everything that you apply yourself to, and grow to become more powerful than you can possibly imagine (compared to the wimpy undergrad you used to be). But I imagine you wouldn't even be doing a PhD if this wasn't your mentality anyway.

I'm a strong believer in committing yourself fully to something if you believe in it, and doing everything within your power to achieve your goals. A PhD is basically a 3-4 year long single project that you can, and should, dedicate yourself too. Now that I'm nearing the end of my own challenge, I wanted to share some simple things with you all that might help in some way.

1. **Don't compare yourself to other people, especially researchers**. Every day, you will see other people achieving their own things. Encourage the success of others, but do not think that this means your own work has any less value. I think this competitive nature of academia is one of the main causes of Imposter Syndrome for researchers. Acknowledge that others will succeed, and that your own successes will come too. Which leads on to...

2. **Be content with your successes**. Celebrate all the things! Get a paper published? Awesome! Abstract accepted for that conference? You're amazing! Get some code to run? Get a beer! Accepting that your successes, no matter how big or small, are meaningful is a great step towards acknowledging your personal worth. Both to yourself and others. That doesn't mean rub them in other people's faces; simply allow yourself to enjoy the feeling of completing something that meant something to yourself or others. It took me about three and a half years of my PhD to get there and realise 'Oh. Maybe I've finally done something good.', and then it was like a cascade from there where every achievement began to mean something and excite and motivate me even more. My only wish is that I'd realised this sooner.

3. **Social media is a doubled-edged sword**. Social media such as blogging and Twitter are amazing to learn for personal development, networking, and science communication. The negative side of this is that social media emphasises point 1 in this list. People basically pump out all of the good things in their lives, and it's like having 1000 marginally interesting success stories pummelled into your face on a daily basis. That is not healthy, as it becomes too easy to see this as a single timeline of success that you could not possibly live up to. This is why it is so essential to know that if you do use social media, what you're looking at is a multitude, and not a single narrative of another person's life.

4. **Challenge everything, especially that which seems normal or is the status quo**. Universities are places where freedom of thought and freedom of expression are standard. Note that this doesn't mean you are at liberty to be a dick, and simply do or say things without thinking them through. If someone tells you to do something 'because that's the way it is', challenge it. Conforming to expectations is not only boring, but changes nothing. Research and academia are places to unleash yourself and your creativity in ways that you will never get in a standard workplace, and you should embrace the opportunity. Rules are meant to be broken.

5. **Having a relationship during your PhD is insanely difficult**. A PhD is so time consuming it's ridiculous. When people say they work 45 hours a week, a PhD student replies "Oh it must be nice working just a part time job..." This impacts quite a bit upon the hypothetical 'work life balance'. I'm not gonna sugar it up, there is no work-life balance. Work becomes your life. Even when you're not working on your PhD, you're thinking about it. Trying to reconcile this with a love life is insane. If you can find a significant other who understands this, keep them for life. If they don't, it'll make the relationship all the more difficult. It's not about placing one person/thing above another, but recognising that at certain times there are certain priorities that have to take precedent.

6. **Take every opportunity to travel**. PhD students can be blessed with unparalleled chances to roam the planet. We get to attend conferences, workshops, talks, and do our research in some of the most exotic, weird, wonderful, and exciting places on the planet. Embrace this chance, as you probably won't get it ever again. Never be afraid to try something or somewhere new, and embrace every opportunity as a new learning experience.

7. **Take every opportunity to learn**. A PhD is a learning experience. Don't ever feel stupid for not knowing something – no-one knows everything, and the whole point of research and education is that we're forever pushing our boundaries by discovering new things. What is obvious to some people is clearly not to others, and you should not be afraid to ask questions, or be made silly for asking them. Over the course of 3-4 years for a PhD, you will be constantly learning new things, expanding your knowledge horizons, and acquiring new skills. Sometimes, you won't even recognise that you're picking up or developing skills. Often, it's worth going out of your way to try new things: a foreign language or a new coding language, creative writing, yoga, art, baking – anything that helps you to enhance yourself.

8. **Use your spare time to learn 'secondary' skills**. By 'secondary', I refer to those which are not strictly to do with research. These include learning how to write for non-specialist audiences through blogging as a form of science communication, learning marketing, advocacy and community building skills as a form of networking and

promotion, and social media usage in order to more effectively communicate with a diverse range of audiences. These skills are invaluable and can open up a multitude of new opportunities, and if you learn to integrate them into your daily workflows can become valuable extensions of yourself.

9. **Learn to code. For the love of God learn to code**. Coding is frickin' difficult, don't let anyone tell you otherwise. Some people have a knack for it, others don't. In the modern age though, the ability to code, or at least read or execute code, is so damn important. I've only learned how to use a bit of R during my PhD, but this basically saved my research just by learning the basics. Websites like CodeAcademy are super-duper useful for picking up coding skills, and good fun and free too.

10. **Some people are assholes, and there's nothing you can do about it**. The common asshole can often be a difficult species to find. Common traits include: 1. Talking about others negatively behind their backs; 2. Only ever talking about themselves and their activities; 3. Interrupting you to tell a story that's just oh so much better; 4. Poisoning the way you think and act so that you begin to question yourself, but not in a good way; 5. Sapping all of your time and energy to deal with them and their problems; 6. Taking everything from you, but never giving something in return. One thing I've learned is not to engage with people like this. People who are not helping to build you are not people to surround yourself with, and are best removed swiftly and painlessly from your life. This also accounts for serial harassers, sometimes even people under the facade of 'close friends', and those who refuse to be held accountable for the words they say and the actions they perform. There is a whole world of amazing people out there, and do not settle for people who act like shit and treat you like anything less than you deserve.

11. **Be there for other people as much as you can**. I might have mentioned this once or twice, but doing a PhD is fucking difficult. Sometimes, those most in need are those who hide it most. Learn to read the signs of when people might be struggling, and be there as a stone pillar for them when they need it most. This is just part of being a good friend, and sometimes for people simply knowing that someone is there for you can make all the difference.

12. **Don't sacrifice your mental or physical health for research**. At Imperial College, almost every grad student I know was suffering from some sort of mental or physical health issue. Alcoholism, depression, anxiety, stress, insomnia – the list goes on. The pressures of academia are insane, and don't harm yourself just to get out a paper or do another experiment. Everything that needs to get done will get done with time. You work more efficiently by pacing yourself. Staying healthy in body is also a path to staying healthier in mind. I started running during my PhD, and found that after a while I was able to focus more, sleep better, and not be so damn

exhausted all the time. Also, don't over-caffeinate – quitting ten shitty cups of coffee a day was awesome, I gained the ability to think again. If you're a coffee fan, have one or two a day strategically. Drink a glass of water in the morning as soon as you wake up, and stay hydrated during the day. Don't binge on carbs, and try and have a healthy diet. This shit actually works, is ridiculously simple, and you'll feel a positive difference. Meditation can also be a powerful method for clearing your mind and helping you to focus – apps like Headspace are great for starting with this.

13. **Publish the shit out of your PhD as much as possible**. I've written about this one already here.

14. **Learn how to empathise with others**. This is a ridiculously powerful way of thinking, and very difficult to grasp. I'm not sure I've got it yet fully, but is something I try all the time. My parents always used to say to me 'treat others how you would like to be treated', and being able to place yourselves in the shoes of others and understand their feelings is important for this. By doing so, you'll be able to understand the problems of others more easily, and generally perceive everyday issues in life from a more enriched diversity of views. It also means that you're not thinking about things selfishly, shallowly, or narrowly. I got sick of people in London being so self-centred about their thinking, when it came to personal and academic issues, and is actually one of the key reasons why I left London and Imperial College in the first place.

15. **Learn how to think about problems from a range or perspectives**. Problem solving is an intrinsic part of academia. Shockingly, problem solving is not easy, either to do with research or real-life situations. Being able to consider problems from as diverse a range of perspectives as possible is a very powerful tool for understanding and resolving them. Learn to be solution-oriented, focus on the positives, and consider how other people are perceiving a situation and what the implications of this are. Follow thoughts and actions through like a web – consider all possibilities and all implications of this. Through this, often the optimal solution will emerge, and you will be braced for all possible outcomes.

16. **If you recognise that you have a weakness, do everything you can to overcome it**. Part of self-development is recognising that you are not perfect. Everyone has weaknesses, or parts of themselves that can improve – if you can't think of anything, think harder, or stop being so arrogant. Learning what these traits are is the first step towards building upon them. For example, if you have an issue with approaching new people and initiating conversation, slowly build up your confidence in smaller steps by approaching groups, people who you know from social media, or by planning out the first few lines of a conversation in your head in

advance. For every problem, there are a thousand solutions – you just have to find that which suits you the most!

DISCLAIMER: These views are based on my own experience, and might be utter bullshit.

Shaping an Open World.

I think the 'Open movement' might have an image problem.

From the outside, and even from within, it might seem as though it's a very low-level affair. To many, I get the impression that it looks like it's about toppling an industry, or implementing a policy change here or there. And with this lots of squabbling between different parties as we debate intricate things like appropriate licensing for creative works and the role of copyright, or how much we should pay for Open Access to research papers.

But for me, the 'Open movement' is about something much deeper.

It's a collective vision about how we shape and embrace knowledge, something at the very core of us all, and the foundation of our civilisation.

What might come across as personal, industrial, or political change is just a façade of the reality. I think many movements might suffer from this sort of image, with a failure to manifest themselves beyond a small scale into the truly global-scale changes they're trying to instigate.

What Open is about is the liberation of knowledge for humankind, and doing ourselves justice as a culture to things we all create, each designed to help us try and understand the world around us.

Open is a massive scale structural re-think towards how we treat and regard knowledge as a society. It's about re-shaping cultural attitudes towards knowledge generation, and the sharing of that knowledge for the betterment of everyone. For me, this is the underlying motivation – that knowledge sharing benefits all of society. The real change here will remain physically unseen, as it has to occur in our hearts and minds.

It's our job to help others see this vision, because if we can succeed in implementing it then we'd have made a step towards building a better world for every single person alive now and forever in the future. The foundation of an 'open world' is very much grounded in principles of freedom and equality, and you don't have to be a scientist to figure out which is the right side to be on. Embrace them, and use them to fight for real change.

I think if we remind ourselves that it's the bigger picture we're working towards, it'll make the smaller fights on the way to achieving it much easier and more manageable.

That's what Open is about, and that's why it's important. This is how I see it anyway – I'd LOVE to know if people see similarly, or differently!

Part of the #JourneyToNowhere series.

Referring Elsevier/RELX to the Competition and Markets Authority. Co-written with Martin Eve and Stuart Lawson, and published on the former's personal website.

Today, along with Stuart Lawson and Jon Tennant, I have submitted the below as a complaint to the Competition and Markets Authority, making good on the advice of Ann McKechin, MP at the BIS Inquiry into Open Access in 2013. The document is also available as a PDF.

Re: RELX Group in Industry 58.14/1

Dear Sir/Madam,

We write to complain about what we believe to be the anti-competitive practices of RELX Group in industry 58.14/1 ("Publishing of learned journals") on the following grounds:

- Abuse of a dominant market position
- Problems in a market sector

The grounds on which we believe these statements to be true (and on which we believe any "reasonable person" under English law would reach the same conclusions) are set out below with reference to 1.) the secondary academic literature that has studied the scholarly publishing landscape; 2.) previous competition inquiries; and 3.) financial statements from RELX Group.

Further, we write following the advice of Ann McKechin, previously MP for Glasgow North, who recommended, in a BIS sub-committee inquiry hearing in 2013, that RELX Group (at that time known as Reed Elsevier) be referred to the competition commission if it continued to use non-disclosure agreements. She called this a "profoundly anti-competitive practice" and said that if this was happening with public funds "there should be a referral to the Office of Fair Trading" (HC 1086-i, 2013).

Background

UK Higher Education is funded through a variety of public and private streams. While much revenue is derived from student tuition fees as an apparently private source, quality-related research funding from government is also awarded to almost every institution through the Higher Education Funding Council for England (HEFCE). Furthermore, most tuition-fee income is underwritten by a government guarantee on the loan (the "RAB charge"), making the majority of "private" revenue also contingent on public funds.

Part of the purchasing from UK universities, funded from this pool of public money, is devoted to buying subscription access to learned journals and books in order to further research progress. In the case of access to Elsevier's portfolio (Elsevier is the trading name of RELX Group's academic journal division), a national negotiating team was convened by Jisc, the UK's digital infrastructure body for higher education, and has been consulting over the last 18 months.

The results of the negotiations that took place with Elsevier are currently being considered by UK universities. However, the details of the agreement are under a non-disclosure agreement. In our view, this represents a serious breach of competitive market practices since it is impossible for other parties to benefit from price competition. Furthermore, that this is used in the expenditure of public or publicly-underwritten funds goes, to the best of our knowledge, against HM Treasury principles for the commissioning and expenditure of public funds. We believe that this is a result of Elsevier's abuse of a dominant market position and more systemic problems of competition in the field of scholarly publishing. As above, a sitting MP recommended that were this to be continued, RELX Group should be referred for anti-competitive practices.

Abuse of a Dominant Market Position

Elsevier is the single largest publisher of scholarly and scientific articles. The UK university community spends around £40m per year on access to the ScienceDirect platform run by the publisher, the Scientific, Technical and Medical division of which made a £760m adjusted operating profit on £2070m revenue in 2015 (Earney, 2016; RELX Group, 2015, p. 9).

Although it is difficult to provide precise figures due to the disaggregation of the market, as previous investigations have also noted (see OFT 396, 2002), we believe that Elsevier exhibits market dominance by the criteria of the CMA by meeting the following criteria:

1. Elsevier's dominance in this space is indicated in a range of positions that we believe exceed or come close to 40% of total supply. A 2002 OFT report noted that the group had a "a forty-one per cent share of the supply of science and technology journals" (OFT, OFT396, 2002, p. 6).

2. Another realistic and reasonable estimate in our view is that a grouping of Taylor & Francis, Wiley-Blackwell and Elsevier account for over 50% of all published science papers in 2013 and 71% for all psychology papers (Larivière, Haustein, and Mongeon, 2015).

3. We believe that Elsevier is not affected by normal competitive restraints. The goods it sells are unique and non-comparable. If a researcher requires a specific article, then no substitute good can be found, which works against competitive market price pressure (Eve, 2014, p. 14).

It is our view that Elsevier unfairly exploits the above dominant market position to avoid price competition in several ways:

1. We believe that Elsevier uses non-disclosure agreements extensively in order to ensure that its prices are unaffected by competition. David Tempest, Director of Access Relations at Elsevier, for example, argued that were other libraries/institutions of higher education worldwide to know the amount Elsevier charges for access, "everybody would drive down, down and down" on prices, leading to users paying less for accessing these materials (the goal of market competition). This is captured on video (Taylor, 2013). This represents, in our view, a substantial discrimination between customers based on little to no material difference in the circumstances of supply, as a result of a dominant market position and a desire to avoid price competition. We see this as consequently unfair to its customers who do not see the benefits of price competition.

2. Because it holds such a dominant market position, we believe that Elsevier knows that institutions of higher education (its primary customers) will suffer if they do not subscribe to its packages. Because it controls such a large portion of scholarly and scientific materials (as above) it is able to leverage an operating profit margin of approximately above 40% in the STM division since 2011 (Larivière, Haustein, and Mongeon, 2015, figure 7), demonstrating, in our view, substantial market dysfunction. We believe that this leads to a situation in which it is difficult for competitors to emerge based solely on Elsevier's dominance. Because library budgets are finite, but Elsevier controls so much of the supply chain, we feel that smaller publishers are unable to compete due to the threat of Elsevier withdrawing its supply to the same customer base.

Problems in a Market Sector

The market space of 58.14/1 is deeply problematic in our opinion for the following reasons:

1. As above, in our view a small number of publishers, and especially Elsevier, dominate the majority of the landscape.

2. We also believe that there is a problem of a lack of price sensitivity among customers. This is fuelled by non-disclosure agreements but also the fact that researchers are encouraged to publish in "respected" journals for hiring and promotion panels, thereby giving the content to organizations such as Elsevier for free (often with no remuneration from organizations such as Elsevier), with little awareness of the strains that this places on institutional library budgets.

3. Because goods are non-substitutable (a journal article cannot be substituted for another since each is unique and novel), little to no downwards price pressure is

exerted, which we believe has contributed to a 300% rise in journal prices above inflation since 1986 (see Eve, p. 13).

4. Elsevier also control data and analytics services that are used by universities to assess the reputation of journals, researchers, and institutions. These services for both citation metrics (used to evaluate researchers) and for university rankings are in part based on Elsevier's own journals, so it is our belief that institutions feel that to be competitive they must have access to the journals that are used to assess their research quality.

5. We think that further evidence of market dysfunction can be seen in Elsevier's extreme levels of profit: up to 42% (RELX Group, 2015), more than double those commonly found in the oil industry (approximately 16%), and far outstripping pharmaceutical companies (around 6.5%).

6. This problem was noted in a House of Commons Select Committee Inquiry in 2013 (as above) and an MP recommended referral to the competition authority were such practices to continue. We believe that these practices are continuing, and indeed worsening, and we would urge the immediate investigation and intervention in this deeply anti-competitive and unregulated space (HC 1086-i, 2013).

Yours sincerely,

Professor Martin Paul Eve, Birkbeck, University of London (but writing in a personal capacity)

Co-signed

Dr. Jonathan Tennant, Imperial College London (but writing in a personal capacity)
Stuart Lawson, Birkbeck, University of London (but writing in a personal capacity)

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OpenCon Berlin – Great success!

Right on the back of OpenCon in DC and my open science talk with the Ministry of Education in Slovenia was our AMAZING OpenCon satellite event in Berlin!

We kicked off day one with an epic hackathon, a 'reproducibility hack' led by Anna Krystalli and Julien Colomb, and with the backing of the PaperHive and Overleaf crews for support. The aim of this was not to see if we could necessarily reproduce a paper or not, but to try and understand the process involved in reproducing a paper, and how authors/editors/publishers etc. can make this process easier when publishing. We are hoping to collate the efforts of this session, and write it up into a paper for people to use in future. Anna has also made all of the tools and details publicly available, which means you can have a go at reproducing the hack itself if you wanted!

Happy hackathon organisers!

For day 2, Jo Havemann has written up a nice summary of the speakers and their talks over at the Digital Science blog. I know I'm biased as an organiser, but look at that awesome line-up of speakers! Thank you to each of them for their commitment to talking, and for helping us to grow as a community in Berlin. Nicolas Schmelling has also written up his views on the event via GitHub, which is kinda cool! Videos of Julia Reda MEP's keynote talk, Oliver Sauter, and the panel discussion can be found here via Digital Science, and the rest should be up soon!

Special thanks also to Laura Wheeler and Tony Ross-Hellauer, my epic co-organisers, to Kerstin Hellbig for offering us the venue at the Humboldt University, and to Figshare and Overleaf for kindly providing sponsorship, which was well spent on cake, coffee, and bagels. Natürlich. Cameron Shepherd from Digital Science has also collated the tweets as part of a lovely storify for you all too (full tweets here)!

After this, that makes something like 6 talks/conferences/workshops/panel discussions in 6 different countries in 6 weeks, and I am DONE. I'm actually writing this in Thailand, and having

a month off work and my first holiday in years. Does this mean I'm cutting back on the science shenanigans? Ha, nope! We just submitted a formal complaint about the publisher Elsevier/RELX to the Competition and Markets Authority in the UK, and Lisa has been trying to organise some joint talks for us about open science in universities around SE Asia! We're also continuing to work on the Future of Peer Review project via Overleaf, that anyone can openly collaborate with. We'll be here in SE for about 6 months, working remotely with ScienceOpen still, then hopefully Vancouver and back maybe in Europe in a year or so recharged to take on the academia world (and more?)

For now, fellow researchers stay focused and committed and doing the best you can do for yourself, science, and the wider public every day. For students (or recently ex ones...), don't sacrifice your physical and mental health for work – it's never ever worth it. Take time off for yourself, you need and deserve it. For everyone else, keep kicking ass

2017

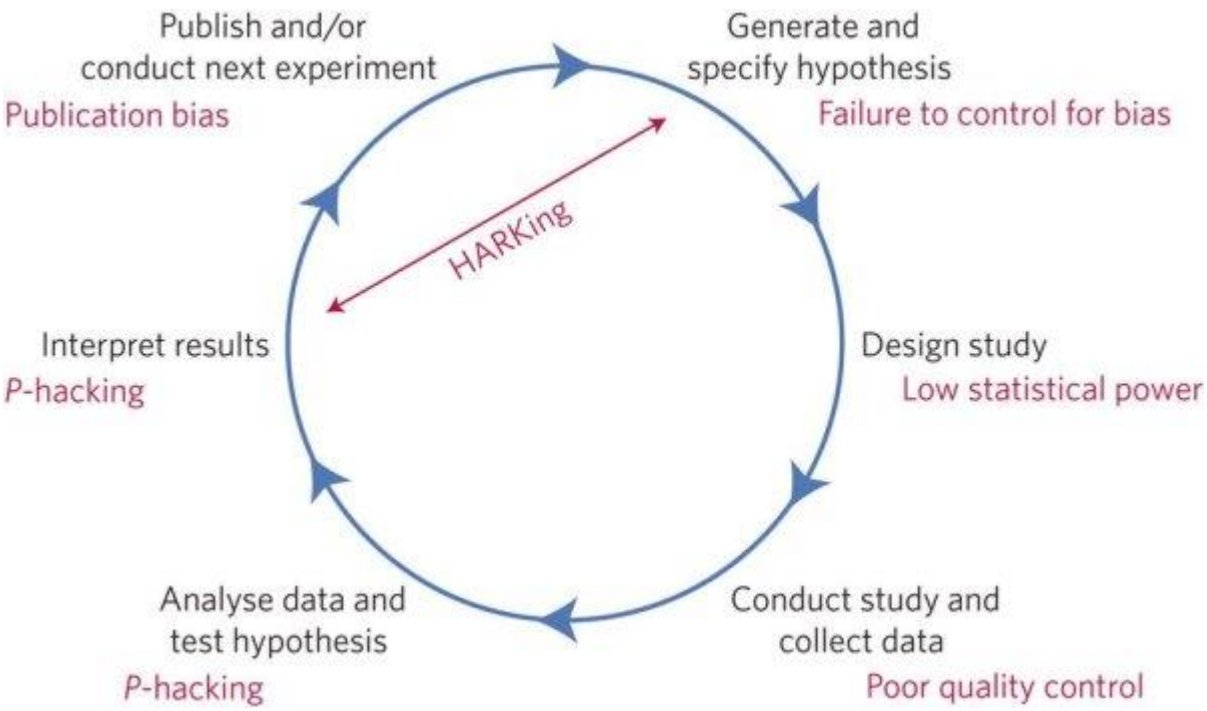
Reproducible science is better science.

'Open' is not an end result for research: it is a mechanism. A mechanism for improved transparency and accountability, for reproducibility and rigour, and efficiency and accelerated discovery.

A new article by Marcus Munafò and colleagues presents a manifesto for reproducible research that highlights this, and contains substantial important reading on this topic. Enjoy!

Abstract

Improving the reliability and efficiency of scientific research will increase the credibility of the published scientific literature and accelerate discovery. Here we argue for the adoption of measures to optimize key elements of the scientific process: methods, reporting and dissemination, reproducibility, evaluation and incentives. There is some evidence from both simulations and empirical studies supporting the likely effectiveness of these measures, but their broad adoption by researchers, institutions, funders and journals will require iterative evaluation and improvement. We discuss the goals of these measures, and how they can be implemented, in the hope that this will facilitate action toward improving the transparency, reproducibility and efficiency of scientific research.



An idealized version of the hypothetico-deductive model of the scientific method is shown. Various potential threats to this model exist (indicated in red), including lack of replication, hypothesizing after the results are known (HARKing), poor study design, low statistical power, analytical flexibility, P-hacking, publication bias and lack of data sharing. Together these will serve to undermine the robustness of published research, and may also impact on the ability of science to self-correct.

How to efficiently stay on top of published research.

One of the major arguments I still hear in favour of journals is that people still need them in order to know where to look for the latest research in their field. With over 1.5-2 million English-language articles in STEM subjects published each year, we each have a monolithic task of filtering out what research is relevant to us.

In terms of research discovery though, journals actually do this very poorly at an individual level. If there are 100 journals in your field, the last thing you want to do is go to each one every day to see if they have published something new. And with around 28,000 journals out there, this can pile up pretty fast for all of us. Searching journal by journal is a waste of time and energy, and these are things that researchers have a lot of pressure on using efficiently and in finite amounts.

There are better ways to discover new research, and here are some of them:

- Create a **Google Scholar alert** based on keywords, field, or authors. This is the best way of getting constant updates of everything Google Scholar finds, including from what we might consider as 'obscure' sources.

- Use **Feedly** **RSS** feeds. You can create RSS feeds for any journal, blog, or news feed, and integrate and organise them here. It updates in real time as new content is published, so you can have all journals in one place.

- **Twitter**. This is where your colleagues will often share the most interesting new research. You can set up 'alerts' too for people who constantly tweet new material, making sure never to miss anything.

- Create or join a **listserv**. A great way of sending or receiving weekly digests of relevant research published in your field.

So, all of these options rely on journals merely as a container, not a discovery platform. Discovery is pretty easy as an overlay feature on top of this, and works across multiple journals and publishers. They don't discriminate based on journal brand or anything, unless you make the explicit and not too smart, decision to do so. If you want to have EVERYTHING as your source of research information, then this is a good way to get started.

These search functions don't care whether the research is published in Nature or the Journal of Snail Psychiatry – they still appear in the same place, with the same text, and the same sort of information contained within them. Relevance isn't defined by journals – it's defined by how you then filter and digest information across these sources.

But what this also tells us is that journals are pretty useless for discovery in the digital age – all we need is a way of searching across venues, which we have multiple efficient ways to do, and then we can stay up to date with pretty much everything published in our field.

There are additional options too, like using the new ScienceOpen saved searches feature, but that's getting revamped at the moment (try their updated search functions in the meantime).

When publishing is like shopping for cookies.

Staying on top of the research literature is really hard. It's even harder because most of the time, we don't actually know what's in a published paper until we've spent the time paying to access it, and reading it.

That's right – you have to pay for access to articles to even figure out if they're relevant for you! How ridiculous is that?

Imagine if we had the same sort of system for other things.

Say you want to buy a cookie. But all you see is a bag on it saying 'Cookie', and it has a price tag of $37.95 on it. You don't even know what sort of cookie it is or if you're going to like it. You get to see the ingredients list, but that doesn't tell you anything about how the cookie is going to taste, or whether you're going to enjoy it.

Your friend tells you the cookie tastes good, so you buy it. But you don't like it, and it turns out you prefer another brand of cookie instead. But you had to spend $37.95 just to realise that you don't want this cookie. There's no way you're getting a refund too – you've already taken a bite out of it. And what if you're really hungry, and in the mood for say 10 cookies? You're going to spend a lot of money on potential cookies until you find the one you want.

Meanwhile, the cookie has magically regenerated, and sits there waiting for another hungry customer to come by and see if they want a bite. That's another $37.95 please.

It's a publishing metaphor. Except imagine if a pack of cookies cost $37.95 to try instead of $1. Good job it's only knowledge we're talking about instead then.

Did Elsevier breach my copyright during peer review?

So, a while back, I got in a scrap with Wiley over their breach of my rights as peer reviewer for one of their journals. Essentially, what it boiled down to was a failure to communicate what referees were agreeing to upon acceptance of a peer review, and as a result breaching their personal rights by enforcing certain things without permission or authority to do so (i.e., what we can or cannot do with our referee reports).

The result of this was a discussion with the Editor and the authors, and as a matter of courtesy I did not publish the report online as not all the authors agreed to do so. However, this was a complex decision process and discussion, which should not really have taken place, as things should have been laid out much more clearly prior to any acceptance to review.

Now, I've hit the same issue after reviewing for a journal published by Elsevier. Except I've been a bit cheeky following the Wiley incident, which has led now to me sending this email just now to the Editor of the journal in question:

Dear XXXX,

I'm just getting in touch about an issue I'm having with this paper that I peer reviewed for you now that it has been published.

I have a Publons account, in order to document my activities as a peer reviewer. I uploaded details of this paper to Publons. However, when I tried to publish the content of the review, as is fully allowed as the rights-holder to that work, I received the following information:

“The publisher requires that you obtain permission from this journal before you sign your name to this review. Please contact your editor.

The publisher requires that you obtain permission from this journal before you publish this review. Please contact your editor.”

I was unaware that by agreeing to review, Elsevier automatically invoked some sort of rights about what I can or cannot do with my review, and without my permission, awareness, or acknowledgement. Can you confirm that this is the case? I believe that this is an error on behalf of the journal, as I don’t recall signing my rights away or agreeing that Elsevier could invoke this sort of thing without my permission. I double checked all of our correspondence too (including some of which was automated), and didn’t receive any information of this sort. Nor can I find any relevant information on the journal or publisher website.

I should also note that if the copyright transfer of my work was automatically implied due to some information on Elsevier’s website somewhere, then I will similarly invoke the information about my peer review activities on my personal website, with exactly the same authority as that by Elsevier:

“Please note that I charge a flat fee of £10,000 for each peer review completed (subject to concessions), which publishers agree to upon my acceptance to review for any journal they publish.”

If this is the case, could you please let me know who I should contact at Elsevier regarding the financial reimbursement. The alternative is that this is simply a mistake and that while Elsevier will have to be more explicit in the future about the rights of referees prior to acceptance of a review invitation, I retain full rights to re-use my work as I intend, which includes publishing the content of the review online. I should note that this confusion is in no way your fault as Editor in this case, and appears to be a higher-level policy issue.

Kind regards,

Jon

So, let’s see how this goes. Either Elsevier are in breach of my own copyright, most likely unintentionally, or there has been some sort of mis-understanding in which Elsevier only owe me £10,000 as a result. *sips tea Englishly*

So, you want to do a peer review..

Doing a peer review is bloody difficult, and not an easy step to take for anyone. I remember the first time I got a review request in the second year of my PhD. An Editor emails you out of the blue, and asks you to provide your expert commentary on research by your colleagues.

EXPERT COMMENTARY. BUT I'M NO EXPERT. PANIC.

Well, you are an expert to some degree. Which is why they emailed you in the first place. Someone out there likes you. Don't decline a review request because you don't think you're qualified, ready, or good enough. None of these reasons are supported by the fact that YOU just got asked to contribute. The only reason you should ever decline a review is if it's completely irrelevant to your area of expertise.

So, let's say you tentatively accept, and are sent a top-secret document which your colleagues have spent years pouring all of their hard work into. And you, you are the one who gets to review it and decide if it's valid research. No pressure then.

So how do we take the pressure off?

Getting started is the toughest part. What do you write about? How do you get your criticisms, positive and negative ones, across in a way that's best for the authors to digest and use? What language do I use? What if I miss something important?

Well, these are all valid issues that we need to take into account.

So take this general template (totally editable by anyone who wants to help out) and use it as the basis for drafting your referee report. Different journals with have slightly different layouts, so you can adapt this as needed. But this framework is good for making sure that you include everything you need to be comprehensive. It's divided into the main sections of a manuscript and the key points that you should be on the lookout for each one. Please do contribute anything that is missing, and please do share this with colleagues who might be looking to step into the murky world of peer review.

Some other key points:

1. Be thorough. Go through every sentence, write down every thought or query you have. It all helps.
2. Be extra thorough. Go through it all a second time, maybe a third, after taking a break from it.
3. Don't be a twat. Researchers are still people you know, no matter how often they come across more like rat-cyborg-zombies. Be courteous.
4. If there is something good, highlight it. Don't be afraid of telling someone they did well.
5. If there is something bad, highlight it. Don't be afraid of telling someone they made a mistake.
6. Think about the kind of feedback you'd want, and provide that.

7. Don't be self-obsessive or egotistical. Self-citation recommendations are okay, just not 100s of them.

8. If you're gonna get personal, take it away from peer review. This is a place for scientific discourse, not petty squabbles. That's what Twitter is for.

9. Read a paper like your friend is writing it. You don't want them to fuck up do you, so give them the best possible feedback so that they produce the best work they can.

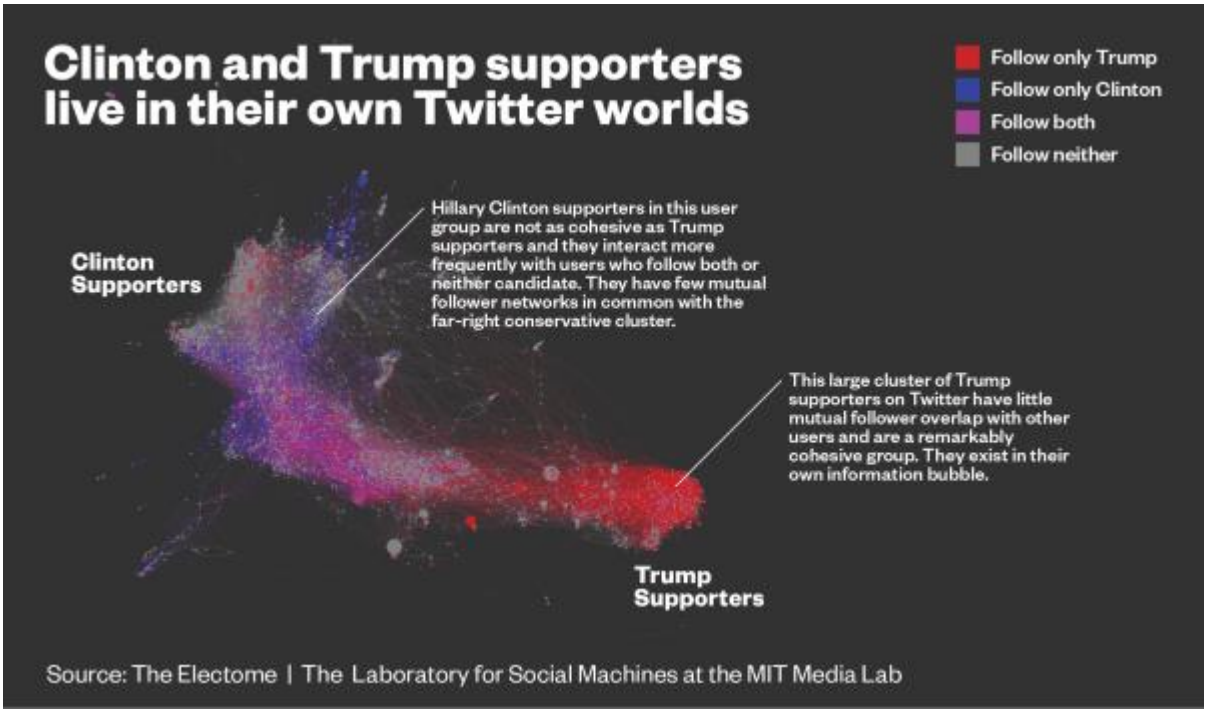
And of course, check with the Editor before accepting anything about what you are actually allowed to do with your review report.

Also, check out the Peer Reviewers Openness Initiative, if that's your sort of thang.

Science, echo chambers, and why facts are never enough.

Social media is transforming the way we engage with one another, often striking a delicate balance between bringing ourselves closer together and isolating each other. What social media has shown us is that humans love interacting with other people. We love having others agree with us, and we love jumping on social bandwagons and lashing out at others with opposing opinions just as much, some times.

Let's look at a topical example of social media usage, like US politics. Here, research from MIT has shown that not only do Trump and Clinton supporters live in their own little social bubbles on Twitter, but that the nature of these bubbles is very different too. Trump supporters form a cohesive bubble, whereas Clinton supporters are broader in their interactions.



Social media bubbles emphasised in all their partisan glory

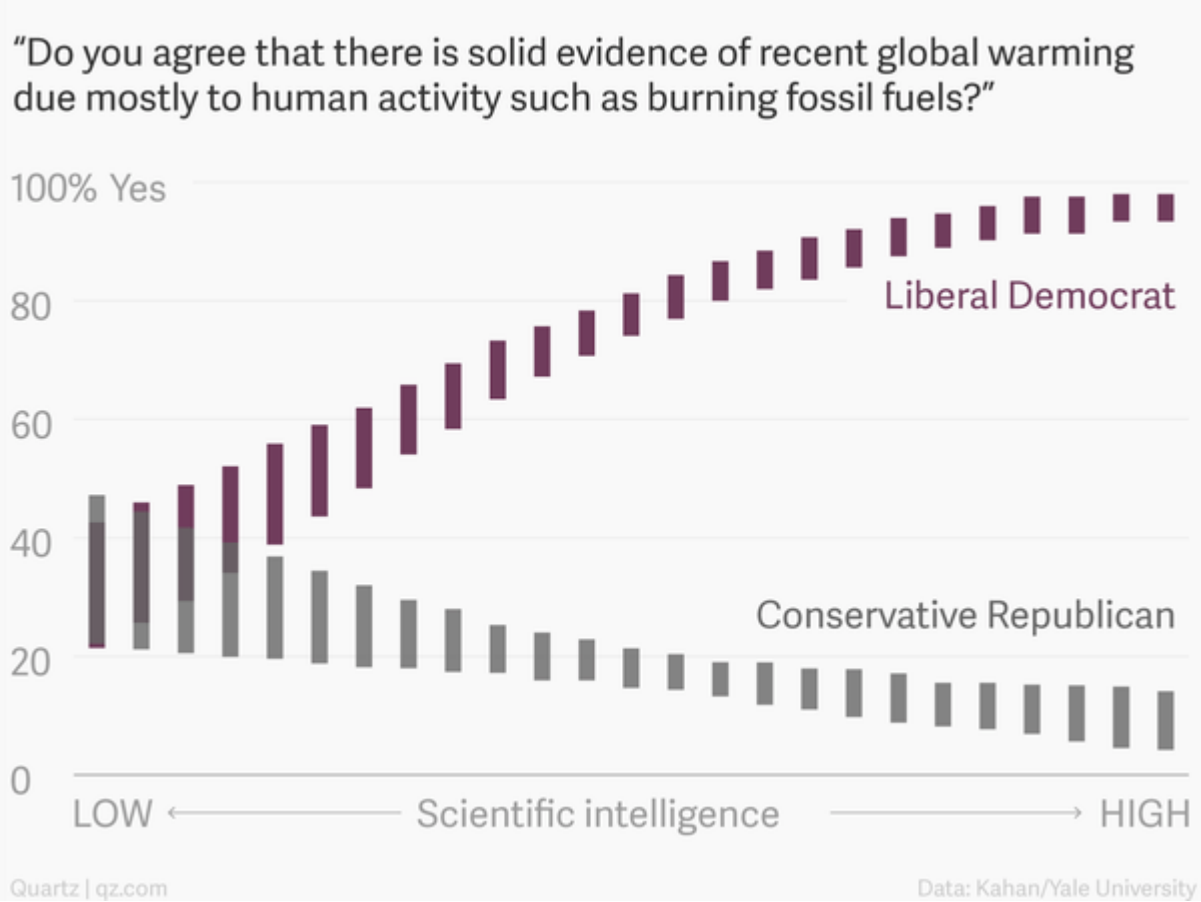
What is a social media bubble or 'echo chamber'?

Wikipedia defines an echo chamber as this:

"*A metaphorical description of a situation in which information, ideas, or beliefs are amplified or reinforced by communication and repetition inside a defined system.*"

In reality, this manifests itself in the form of polarised and isolated groups, in which people tend to promote their favourite narratives, while ignoring conflicting ones and resisting information that doesn't conform to their pre-existing beliefs. This should be of grave concern to those who support science communication as a narrative whereby we simply fling facts at people and then expect them to change their beliefs as a result of this. This is the sort of arrogant elitism that actually puts people off, rather than winning them over.

Recent research has even shown that people won't use science in a 'rational' way that we might expect, but rather to justify and reinforce their pre-existing beliefs, and even become more partisan in the process.



The mis-match between scientific intelligence and your stance on climate change. Source

But do you know what's worse than having a personal echo chamber? Remaining silent.

And do you know what's worse than only listening to like-minded people? Listening to no-one at all.

Features of an echo chamber

The notion that an echo chamber exists as a self-congratulatory, monochromatic, static entity seems to me quite simplistic. It's a nice way of dismissing someone's efforts or viewpoint, which makes it quite appealing to wield around in arguments instead of, oh I don't know, providing useful evidence or commentary.

Anyway, all you really have to do is spend 5 minutes on any social media channel to see the range and diversity of perspectives, experiences, cultures, belief systems, backgrounds, and personalities around, and you will realise that the concept of an 'echo chamber' is pretty complicated.

So, here are the questions I'm going to be thinking more about in the future, in the context of science communication and academia:

- What is the information composition of an echo chamber?

- How permeable are chamber walls?
- How do we expand or perforate the chamber?
- How do we 'break' into someone else's chamber?
- To what extent do different chambers overlap?
- How does scientific research behave compared to different types of information in these dynamics?

Does 'open science' have an echo chamber problem?

I would hypothesise that the problem is perhaps not as bad as it seems, or is sometimes communicated. Or at least, is much more complicated than one might imagine. Small chambers might exist, but do you know what we also call them when we're not being negative? We call them communities. Where like-minded people come together for support, discussion, or simply to recognise the existence of a commonality. We don't call it an LGBT 'echo chamber' because it's where the LGBT people go to for support, discussion, or advice – we call it a community. We don't call it a 'Christian echo chamber' because everyone reads from the Bible. We call them communities, or congregations.

So, one extra question to answer would be 'When do we define an echo chamber as a community?'

There's a lot of research out there on how social platforms like Facebook algorithmically and personally create echo chambers for users. But it gets hurled around quite a bit too, especially by academics. For example, the 'open access echo chamber' is often used in a fairly pejorative sense to attack those who support the principles of open. And vice versa, some 'open advocates' might use the slur 'legacy publishers' in the context of an out-dated echo chamber within the scholarly publishing industry (guilty).

As someone 'inside' the 'open echo chamber', I don't see it as that. I genuinely see it as a community, where different voices are amplified and listened to, and where new and conflicting perspectives are discussed and embraced. Anyone who has ever attended an event like OpenCon can testify to this.

To that end, the creation of 'echo chambers' actually could be positive in bringing people together. It's just what we do subsequently that becomes important.

Break down walls, burst bubbles, and build bridges

We create magic in this world when we break down walls and replace them with bridges. That is one major principle driving the 'open movement', and emphasised quite a lot at this year's OpenCon, with the added dimension of the dark political times in the USA.

What we need then is to figure out how to break down chamber walls should they exist, pop bubbles, and find ways of engaging people and groups – especially those who might feel isolated for whatever reason – and do a better job of connecting people in the future.

One way to not go about this as scientists, which is often not only performed by celebrities, but praised and applauded at, is to throw facts at people and expect their entire belief systems to collapse. And then look around in arrogant bewilderment when that doesn't work. This matters for everything, from showing graphs about climate change and evolution, all the way through to, oh I dunno, the massive increase in prices in subscription fees to publishers.

Scientific engagement should not be a publicity stunt

If you want to break down barriers, if you want to win hearts and minds, then you have to do so on a deeper, and often more personal level. This involves listening often being the first step. It doesn't matter if you're an 'expert' on something or not; engagement needs context to work with, and you don't get this by simply blasting out information. A huge problem here is that often scientists will equate 'science' with 'evidence' or 'reason', and therefore expect attitudes to change when presented with research. If you come from a platform of purely science, and refuse to actually do anything to engage on a personal level, don't be surprised when people resist or begin 'hating on' experts and expertise.

This is actually a fairly unpopular opinion among scientists, because it means that science, shockingly, does not hold all the answers and is not always right. It also means that they have to talk to people, and from a platform of equal level, and that's something that a culture perforated by rife egotism and arrogance isn't exactly fond of.

Look at science celebrities, like Prof. Brian Cox, who thinks that simply showing a graph to a 'climate change denier', a term again which I'm sure they love to be called, will be enough to convince them of the reality of it. What utter elitist, arrogant, and naive bullshit. But in this example, look at how he's cheered on by the baying crowd. I'm sure the 'denialist' went home and had a long, hard look at the science behind climate change as a result. One simple rule of scientific engagement that I shouldn't even have to write here really is: Don't be a twat about it.

We've had scientific evidence of dramatic climate change now for decades, and still people resist it in various ways, so clearly there is something more to engagement than just 'science = opinion.' Go out there and find why people don't accept it. Expand your bubble, and try and understand theirs. You learn by engaging, not by pompously wielding facts around like some superior overlord of science.

And you know what? No matter what someone's views on something might be, I guarantee you you'll have a much more progressive and respectful dialogue with them once you get off that mighty high horse that science has propped you up on. A surprising number of people discuss things rationally when you don't come across like a pompous asshole.

Recognise that different people think differently to you and have different beliefs. That's a way of breaking out of an ivory tower, and using your knowledge to make a real and lasting difference for people.

Curiosity taught the cat about climate change

If you want to make a real change, get people curious! Science is exciting enough by itself. Look at the impacts and history of climate change – use it tell personal stories, to construct narratives and meaningful messages, and let the natural curiosity we have as humans do the rest.

Put it into context. Why does someone not accept the scientific evidence? What is their personal reason for not doing so? Don't make them feel shit for it, that is quite literally the worst possible approach you could take.

Find the angle, make it work. It starts by acknowledging that facts are never enough.

Shockingly, I like the comment here by Lisa to finish off (also partial inspiration for assembling these thoughts here):

The point is that echo chambers are a collective responsibility to avoid, and we should do more to pop them and embrace alternative viewpoints to our own, and engage with them with civility.

Who isn't profiting off the backs of researchers?, Discover Magazine.

ResearchGate-gate isn't quite as catchy as other scandals, but it is something we might be hearing more about in the future. A recent article published by Sarah Bond at Forbes encouraged researchers to remove all of their articles from the for-profit company, Academia.edu. This has led to a wave of account deletions at the site, and also at ResearchGate, two sites duelling with each other to become the "Facebook for academics." The issue Bond raises is this: Why should companies generate profits from research with little transparency? It's a good question. This sounds suspiciously like the entire scholarly publishing ecosystem to me, and it is not clear why Academia.edu is in Bond's crosshairs. For decades, for-profit companies have been making vast sums of money from researchers' work, and often with profit margins in excess of 35 percent, greater than those even of Google (25 percent) Apple (29 percent) and even the largest oil companies like Rio Tinto (23 percent).

The 'Facebook for Academics

The traditional scholarly publishing market is worth an estimated $25.2 billion USD each year, most of which is generated through publicly funded researchers who provide their work for free to publishers, having that work reviewed for free by their peers. Then, publishers turn

around and sell each piece of research for around $40 a copy. In exchange, researchers get an extra line on their CV and a trip to the journal's headquarters to celebrate contributing to the publisher's vast profits—I mean, humanity's corpus of knowledge. This is a vast, global ecosystem that researchers fuel every day, and one that is undergoing quite a state of upheaval at the moment as more researchers realize just how daft the whole thing is. So why treat ResearchGate and Academia.edu differently? In her *Forbes* article, Bond states:

"Moving our papers away from Academia.edu is then about taking possession of our work and deciding what we do with it, rather than allowing a private company to use our scholarship for profit."

This critique of Academia.edu is a bit odd, as the academic publishing system is exactly that: private companies making money by taking researchers' work and then selling it. One of Bond's key arguments is that in December 2016, Academia.edu revealed its premium feature alternative business model. Going "premium" provides additional information to users such as who is reading their work, the reader's academic role, geographic location, university affiliation, as well as the source directing them to your work. Bond argues that this promotes academic class politics and hierarchical stratification. Additionally, Bond argues that the platform can now collect and evaluate data provided by users, and possibly sell it. Again, it is not clear how this differs from publishers that harvest data based on content researchers freely provide. But by all means, if this concerns you as a researcher then delete your accounts. But you should probably also then stop giving your research away for free to private publishing companies too. And delete your Facebook and Twitter accounts too, while you're at it.

Two Sides to Every Coin

If anything, these data analytics on both platforms provides a valuable service to researchers. Both provide metrics on article re-use that are useful for researchers in seeing how their work is being digested by the community. ResearchGate even provides citation scores now too for researchers, similar to Google Scholar and other for-profit platforms like ScienceOpen. And all of them do this for free to users, removing some of the domination over citation metrics that Web of Science and Scopus, both premium and privately owned services, used to have. Richard Price, the CEO of Academia.edu, has even stated "The goal is to provide trending research data to R&D institutions that can improve the quality of their decisions by 10-20 percent." That sounds pretty useful to me for a lot of different stakeholders, including researchers themselves. So, here's the question: Why does it matter if they are making money from publishing data? If someone sees an opportunity in making large-scale assessments about scholarly publishing and research in general, isn't that a good thing? One of the main reasons why we publish is so that other people can re-use our work. Publishers don't pay researchers for giving them their work, so it remains unclear to me again why this should be viewed as different for ResearchGate and Academia.edu. Except that these platforms seem

to legitimately give something of value in return beyond a brand name. As such, Bond's arguments aren't particularly convincing; they seem to ignore the bigger picture of our enormously broken scholarly publishing system. Things have got so bad, that whole universities and countries are now taking a stand against the profiteering nature of some publishers. Making money while improving the overall system of scholarly communication is feasible, and none of the arguments put forward convince me that either platform is in actual conflict about this.

Dark Sharing vs. Open-Access

It's no great secret that a large chunk of the articles posted on both platforms are done so illegally. Many publishers require authors to transfer their rights in order to be published. While this practice is in itself questionable, this does not legally justify the large-scale copyright infringement that is so apparent on both sites, irrespective of how useful it might be to authors. As a consequence, one of the biggest scholarly publishers, Elsevier, sent 2,800 DMCA takedown requests of articles it published that were illegally hosted on Academia.edu. While this was a generally bad PR move for both Elsevier and Academia.edu, Elsevier were technically fully within their rights to do so. An overarching problem here is that ResearchGate and Academia.edu are not accountable to anyone but their shareholders. When questioned about illegal file hosting, they can simply wave their hands and say it has nothing to do with them; instead, fault lies with the choices of their members. In the meantime, they can both keep using this illegal content to enhance their data analytics, which is perhaps more of an issue than what they then choose to do with such data. One can easily be fooled into thinking that this sort of 'dark sharing' with ResearchGate and Academia.edu is a good compromise for getting open-access publishing right—it's not. If anything, dark sharing undermines open-access progress by providing a quick shortcut that lacks the stability and management of a journal or repository system. But at the end of the day, even open-access is being used as a way for publishers to make additional money from your work. While around 70 percent of journals indexed by the Directory of Open Access Journals do not charge to publish, the majority of large publishers often charge in excess of $3,000 to publish. Posting to Academia.edu is no more difficult than freely posting to an institutional repository, yet with allegedly more than 47 million members at Academia.edu, publishing there is appealing. Academics precariously use it as a professional advertising tool, and in an academic environment where egotism and self-marketing is rewarded more than sharing, it is easy to perhaps see why one is more popular than the other.

All Is Not Lost

There are many institutional repositories out there that have one job: make researchers' work open-access in a manner that is compliant with funding mandates and publisher policies. There are a host of other subject-specific or cross-disciplinary repositories too. These include Zenodo, a non-profit and funded by OpenAIRE, the European Organisation for Nuclear

Research, CERN or the arXiv, which has been hosting articles since 1991. Ethan Gruber has even recently launched a tool that transfers all of your content between Academia.edu and Zenodo, for those interested. For me, I deleted both of my accounts through redundancy as I was just not seeing the value in them. I have already made all of my research openly available through my institutional repository at Imperial College, as required, or available at open-access journals. Being in a position where you can delete ResearchGate and Academia.edu accounts is actually a position of academic privilege, and telling other authors to do so could be inconsiderate of their position and status. So, I think a lot of the angst towards Academia.edu and ResearchGate might be better placed elsewhere. We have an entire scholarly publishing system that is largely fuelled by taxpayer money, but governed and constrained by private interests, and that should be something of much deeper concern. ResearchGate and Academia.edu are small fish in this vast sea of profit-seeking. The real question is what do we do when private interests actually start to interfere with those of the public, as many scholarly publishers actively do by prohibiting access to research – indeed, this is how they make their money. I don't see Academia.edu and ResearchGate doing that, or at least not to an extent that is greater than any other for-profit company involved in scholarly publishing. If you want to actually do something useful, choose open-access, and share your research far and wide. Just don't lock it up. *Author note: Thanks to Lisa Matthias and Penny Andrews for discussions on this topic.*

Imperial College disavows the beloved Impact Factor. Boohoo.

Yippee! Imperial College London have signed DORA, the San Francisco Declaration on Research Assessment! This basically means that the impact factor will no longer be used for research assessment. This follows the widespread documentation of its inherent flaws its but perplexing and continued mis-use.

This is HUGE. Impact factors will no longer be promoted, either directly or indirectly, in staff assessments. This means that people have to actually use methods that make sense when it comes to defining the structure of academia. Fancy that!

Credit: Hilda Bastian

Over a year ago now, I wrote to the Rector and Vice President of Imperial College asking them to stop relying on the impact factor as a metric for research assessment. I doubt this letter had any real impact, but either way it is amazing to see them finally cotton on and make a really ridiculously positive move for research and researchers.

The motivation for asking this was as follows:

I therefore encourage Imperial College to sign DORA, as part of a move towards establishing better criteria for selection and assessment. I see the adoption of the recommendations from DORA as a way of promoting a healthier research culture at Imperial College, and a transparent, more informed measure of the research conducted here.

Some other UK-based universities have already signed (e.g., The University of Sussex and University College London), as well as leading academic societies (e.g. HEFCE, the Wellcome Trust and the Royal Society). However, at present the strongest support for DORA from universities has come from US, so there is an opportunity here for Imperial College to show leadership within the UK HE community. I envision that this will have a knock-on effect, encouraging other universities to sign, as part of a cultural change towards more sound methods of research assessment.

I should note that when I wrote this, it was generally met with the usual scorn from academics, saying that Imperial College would never do it, it was too risky a move, stop compromising the careers of junior researchers etc. The letter was completely open to anyone too, and I'm currently unaware whether anyone else has decided to actually take up the gauntlet and use it.

The page on the main website at Imperial College now reads as thus (my emphasis):

As of January 2017, Imperial is a signatory of the San Francisco Declaration on Research Assessment (DORA).

We are committed to ensuring that we will not consider journal-based metrics, such as journal impact factors (JIFs), in assessing the research achievements of staff or candidates for recruitment. Instead, in line with the Richardson review, we are determined to ensure that our procedures are grounded in appropriate evidence and fully contextualised.

Signing DORA means that ***JIFs will no longer be promoted, directly or indirectly, in the assessment of our staff, or in job adverts and person-specifications****. We aim to give clear guidance to candidates for promotion or hiring on our assessment procedures.*

These moves should in no way inhibit the choices made by staff on where to publish their research outputs. ***They are intended to give staff confidence that their work will be judged for what it is – not where it has been published*** *– alongside their other contributions to College's educational and societal mission.*

Signing the declaration is also intended to empower staff to challenge any instances of practice that deviate from the goal of ensuring that research assessment practices are as rigorous as possible.

We recognise that establishing a transparent, evidence-based processes of staff evaluation as part of a culture that aims to be fully inclusive will take time. We look forward to working with all members of the College community in achieving that.

This is an ENORMOUS step for research at Imperial College, research culture, and research in the UK more broadly, as well as removing some of the stranglehold this awful metric has in governing academia.

Let's hope other institutes follow suit now, and we all continue to actually do research assessment in a scientific manner, and not based on metrics that have absolutely no place in doing so in the first place.

I've also written much about how academia can kick its addiction to the impact factor for ScienceOpen, including by signing DORA.

Open Access should never be the end game.

Open Access needs to be used more effectively to tear down barriers to research accessibility.

The '*open*' versus '*closed*' access debate probably doesn't make that much sense to many people. Including myself, actually. It's not immediately clear what either term means in

different contexts (e.g., data, review, research, science), or what we actually even mean by 'access'. And that's after I've been engaged with this whole 'Open Movement' for like, 6 years now.

I know what 'Open Access' means very bluntly, in terms of anyone being able to read and re-use research articles, but reckon this doesn't get the importance of it across enough.

For myself and many others, the importance of Open Science/Research/Knowledge/Access, you name it, has always been at least partially grounded in ethics. I believe that every person should have the ability to access knowledge as the output of research or for educational purposes, should they desire. Business models, rampant profiteering, gold versus green, and all that jazz have always been secondary as the 'how' of Open Access as opposed to the more important question of 'why'.

So, I don't feel this simple basis for Open Access is enough, or communicated as effectively as it could be. And often it ignores the much larger issue of *accessibility*. That's the 'why' part.

Open Access is not enough

I also believe that knowledge must be made as accessible as possible. And by that, I mean transcending or overcoming potential issues to do with language, technical infrastructure, software, disabilities, and anything else which prevents research from being accessible. These are barriers to digestion, understanding, and re-use.

As such, it might be easy to see why Open Access doesn't really matter to many people – why should they care whether they have access to research papers or not, if they don't have the technical skills or prior knowledge of a subject, for example, to actually be able to digest the information contained within research articles. Many researchers don't care about Open Access either, as they don't see the issue. They have access, so what's the problem? They can read papers because they are trained to do so, so what is the problem?

My mum just stared blankly at the screen for 10 minutes when I showed her my last paper before I let her off the hook and had to go and make a recovery cup of tea.

Well, I don't think there is really much of a point in having total Open Access if no one can actually *access* the knowledge and then maximise the re-usability of it. Knowledge isn't really that useful if it just sits around doing nothing. If no-one can actually re-use it, beyond simple licensing restrictions.

And that's just in terms of general understanding and prior knowledge. What if you were vision impaired? What if you were in a rural environment with no internet connection*? What if you can't afford a computer, laptop, or phone to read papers on? What if you couldn't understand English, like the vast majority of people on this planet, yet for some reason it is the main language science is performed and communicated in.

None of these things are solved by simply having access to papers. They are made easier, as it means we can take research and re-use it without restrictions to help overcome these barriers to accessibility. A paywall is just one impediment to accessibility.

So, for me, I don't think Open Access is enough, as it only breaks down one barrier. It never was enough, or intended to be so. Open access is a foundation, or a mechanism.

What is Open Access a mechanism for?

But then what is Open all about? Well, for equity in accessibility. For a fair chance at being able to learn. This is why 'Open' is important, and why I don't think calling it 'Open Access', or thinking of this as the end point, really works on some levels.

It's a bit deeper, and more complicated, for me. I see it more being about 'privileged' versus 'equal' access, which recognises the inequalities beset in our knowledge communication and accessibility systems.

This sort of realisation probably only ever rarely comes to scientists, because they think that Open Access or accessibility isn't an issue because someone somewhere has spent a fortune paying so they can read research papers (thank, librarians), and have spent years of their lives training to be an expert in a field so they can actually understand and use research. It's difficult to realise you have this sort of privilege until it is taken away from you. This was one of the things that frustrated me most actually while working at Imperial College (very wealthy) as a grad student (very poor), and trying to convey to staff/students that access to literature was a problem that went beyond just them. I will never be surprised by the selfishness of some researchers.

But anyway, if we want a greater public understanding of science, a more knowledge-equipped society, more informed debates about climate change, evolution, natural resource consumption, mental health issues, drugs, about anything at all, then we have to go beyond just making research papers free to read. We have to recognise all the potential barriers in accessibility, and work harder to overcome them. Initial access is just the beginning of this.

Open Access is fundamental to science communication

We have to innovate more in how research is presented, communicated, and engaged with. Thankfully, there are already whole cohorts of amazing people working in the fuzzy world of science communication and public engagement with science. Just with the rise of things like 'alternative facts' (aka bullshit), I think it is clear that we have to do better at making science more accessible to everyone, and do a much better job of putting it in a wider societal or cultural context for different publics.

This ties in with what I said in a previous post about presenting scientific facts to people and expecting miracles to be not only pretty arrogant, but also fairly shallow in our understanding

of how people process different types of information. There is more to it than just 'educating' people with science facts – there are political or commercial, or cultural and social, aspects to consider. And that's the context that science needs to be put in.

Science needs to be open for it to flourish, but to really blossom it has to be made more accessible.

What is stopping us?

What is sometimes perplexing is that we seem to take pride in a general lack of accessibility in science. Colloquialism in papers is strongly discouraged, individual fields have their own bizarre lexicons of words only they would ever possible use, and we write in this perplexing scientific style seemingly to make content as inaccessible as possible; or at least to only appeal to those in our immediate field who have a substantial understanding of the topic anyway.

As a personal example, my girlfriend is German, and a political scientist by training. She speaks pretty good English (better than mein German...), and for some bizarre reason has made a valiant effort to actually read some of my published research. Now, it's all Open Access, but usually it takes about 30 seconds for the headache signs to begin, and instead I direct her to media coverage or my own blog posts about the work instead.

So, I kinda failed here, and it's based on how I've been trained, and how we're all trained as scientists. I didn't write my papers for a 'non-specialist' audience. As in, I didn't make them accessible to anyone unless they were already fairly proficient in the field. Thinking about how research is communicated often happens after we have already published an article, rather than at the offset.

Thinking to the future

I think we could do a lot better at this as a collective by embedding communications strategies in our activities as researchers right from the beginning of new projects. Blogging, giving public talks, tweeting, translating, sending to relevant communities with non-specialist summaries, getting feedback and seeing how you can improve things in terms of accessibility as a process could be very powerful in improving the understanding of different aspects of research projects. Has anyone written a handbook for researchers in 'Making Science Accessible' yet? that would be sweet.

This is important for scientists across different fields too, in order to increase cross-disciplinary research. I'm a geologist/palaeontologist by training. This means that I'm a non-specialist in every other field by default, and would probably bust a blood vessel trying to read the latest in regenerative medicine or biotechnology. Making research more accessible could be a great way to help decrease barriers between different sub-fields and really open up opportunities for stronger collaborative research across fields.

For me, I blogged about most of my research papers in an attempt to convey the key findings, the importance, and the context of the research, and this is something which many researchers are doing now and it's amazing! And if people want to learn more, then the papers are Open, and the opportunity for them to do so is there. You don't get this with privileged access, as you don't have access to the primary research unless you can pay. But I'm still not sure if this goes far enough by a long way.

So yeah, while Open Access is still beset by implementation problems, it opens up a whole new set of issues about what do we do with this information to maximise its accessibility and potential.

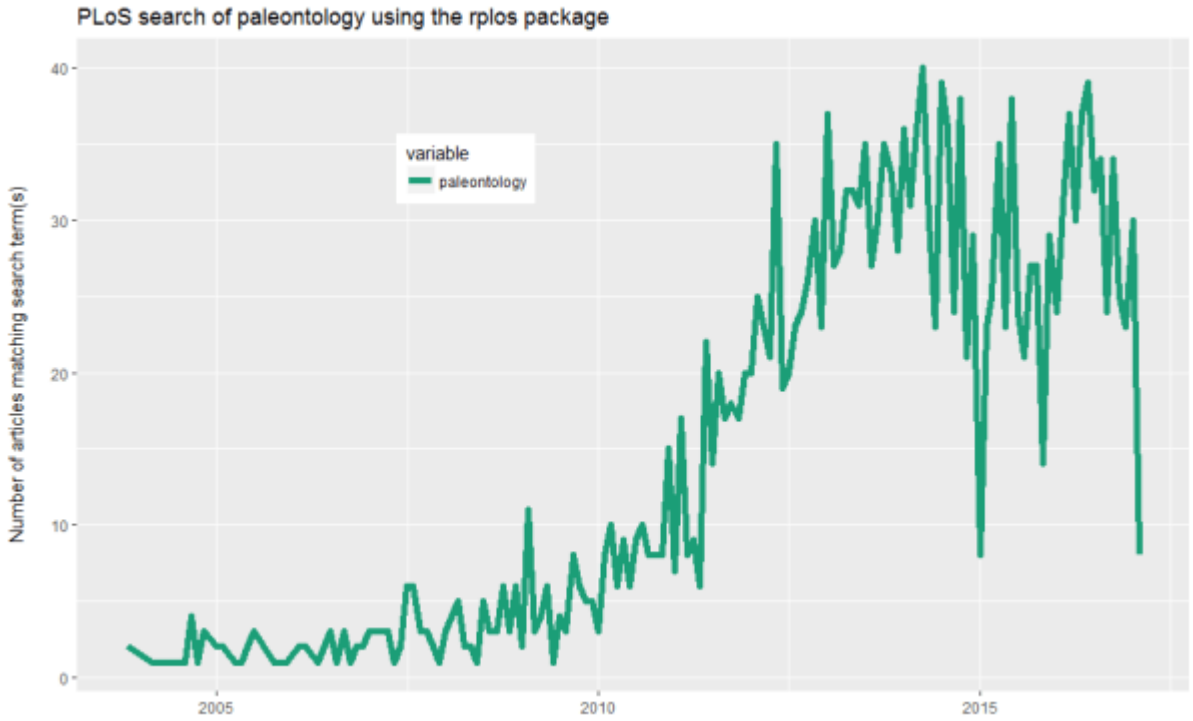
Answers on the back of a postcard.

*I'm actually writing this in Cambodia at the moment, and it's taking me forever due to the crappy internet connection. And trying to download research papers via Imperial College's VPN, or ones that are OA, is taking so long it makes the publishing process look fast.

Is PLOS ONE losing favour with palaeontologists?

Is PLOS ONE falling out of favour with Palaeontologists?

By looking at a simple plot of publications through time, it would seem that the zenith of PLOS ONE has been reached after a surge in increase as it dominated the market, but is now in sharp decline. There have been a couple of such blips, with subsequent recovery phases, but the overall trend would seem to be one of a decline since 2014.



Results of a simple search using 'Paleontology'. Yes, it's the American spelling...

Here's the simple R code I used to do create this plot:

 # Using R to visualise Paleontology publications in PLOS ONE through time

 # Install package from within R

install.packages("rplos")

 # Load package from library

library("rplos")

 # Search for the term 'paleontology'

searchplos('paleontology', 'id,publication_date', limit = 10000)

 # So, there's a lot of data...

 # Let's try plotting it!

 # Plot results through time, no limit on data

plot_throughtime(terms='paleontology',limit=10000)

 # You can try this with any field really

plot_throughtime(terms='political science',limit=3000)

Well, I'm going to guess that this trend it's because of the rise of Nature Communications and it's little cousin, Scientific Reports, as well as PeerJ. Or an expansion of the 'megajournal' market.

Now, the research published in any of these journals is objectively no different than if it were published in PLOS ONE, or any other venue. But it's a marketing thing, isn't it? PLOS ONE has a bit of a reputation of a sort of 'dustbin' for research, publishing anything and everything that's scientifically sound. For some reason, many equate this as the peer review being less rigorous ("peer review lite"..), whereas its proponents will simply state that it is more objective, as it doesn't do weird things like trying to assess research impact before it's had a chance to even make an impact.

PLOS ONE also doesn't exactly have the greatest reputation after a couple of Editorial 'SNAFUs', and issues with the publication process (e.g., it still doesn't offer page proofs). I will say that while many journals suffer from these sorts of issues, PLOS ONE definitely gets a skewed amount of researcher angst when a mistake is revealed, for some reason. I don't know why this is, but all you have to do is look at the relative amount of social media ranting when a PLOS ONE paper gets retracted compared to when it happens in Nature.

If this seeming trend of decreasing PLOS ONE papers were a cost thing, then all of the research being lost from PLOS ONE ($1495 per article) would be going to PeerJ ($1095), depending on membership fees ($399/author for 1 paper/year for life), or another cheaper venue (many Palaeo journals such as APP or Palaeo Electronica are free to publish in and still Open Access). Both Nature Communications ($5200) and Scientific Reports ($1675) largely do the same thing editorially as PLOS ONE too, although the former is more selective, but have the advantage of having the Nature brand attached to it. And many researchers are suckers for brands, forgetting it is the value of their work which builds the brand of a journal, not the journal conferring some sort of quality mark on their research.

But I don't think we'll see that PeerJ or these other cheaper/free venues are exclusively 'snaffling' PLOS ONE's authors in the data, as we're still seeing many Palaeo papers appearing in a whole range of venues. And this is because the cost of publishing doesn't matter to researchers – most of the time it doesn't make a difference if it costs $100 or $5000 – they either can or cannot afford it, and for those who can, they are rarely accountable for the funds which they draw upon to do so.

I've even got two papers in Nature Comms, one in PeerJ, and one in PLOS ONE. In my experience, the entire publication process was no different between either journal, except that the former was around 4 times the cost per article than PLOS ONE (we got a fee waiver for PeerJ because they're awesome).

So, I don't really know what to make of this so far. It seems like the 'megajournal' market is well and truly open (no pun intended), and I would hazard a guess that researchers care more

about journal reputation than the cost of submission, because generally our incentive, financial [in]equality, and accountability systems in research are all pretty messed up.

The future of scholarly publishing.

If we were to have to invent the scholarly publishing system again from scratch today, what would it look like?

Our current system of publishing is basically identical to that of what it was in the 1990s, before the emergence of a vast array of internet-based technologies, loosely termed Web 2.0. A research paper is a 20th century format, published in a 17th century container – the journal.

Ironically, this system still persists despite the blatant fact that anyone can publish anything they want at the touch of a button these days. Yet scholarly publishing still usually takes months, and sometimes takes even years, just to upload content to the Web.

Why is the system so slow?

The main problem of the current system is that access and communication are moderated by entities who sustain their business models by prohibiting those things. As such, no-one has access to all information legally, access is conferred by financial or status privileges, and an enormous access barrier exists between users and providers.

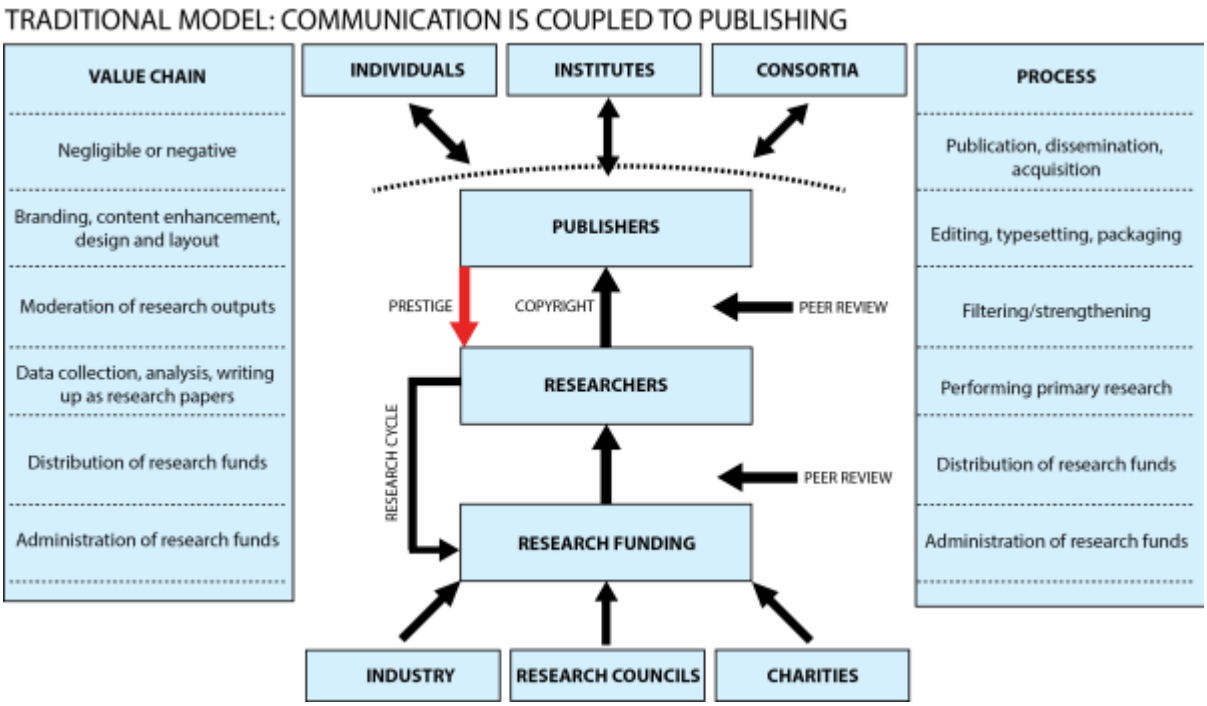
Furthermore, these same publishers hold all of the strings controlling the same system.

Firstly, researchers MUST submit their work to certain journals they publish, as these convey some sort of 'prestige' factor upon researchers, which is used in all forms of evaluation. This is still the broad reality, whether we accept/agree with it or not, and no matter how much things are evolving away from this standard.

Secondly, libraries and research institutes MUST subscribe to these journals in order to sustain access for the researchers they represent. As each research paper is unique, there is no bargaining position for anyone, and secrecy often governs how much is paid and for what, making any form of fair competition impossible.

Publishers know this, and therefore moderate the system by taking the rights from those researchers, and using these to '*convince*' libraries into paying for access to that content. This is perhaps the simplest way of trying to describe the current system in any way that makes sense to me.

Whichever way you look at this, it is broken. It is biased, the incentives are skewed, it is closed, and it fails to meet even the most fundamental goal of communicating research to the maximum possible potential effect.



Broad overview of the traditional research publishing cycle/model

Even Open Access publication doesn't solve this much, as the consumers still typically have to financially feed the publishing system one way or another, and this still only provides free access to a small, but increasingly large (~20-25%) portion of the published research literature.

The core problems

The biggest problems to overcome in any scholarly communication system are that of **content moderation** and **evaluation and prestige**. However, the former of these is already mostly performed by the research community for free, and we call it peer review. In the traditional model of peer, the actual effect of this is poorly understood. But it does have the traits of being closed, secretive, and exclusive, therefore making it far from any objective or rigorous standard of research evaluation.

Prestige is conferred by journals on to individuals, usually conveyed through the general reputation of a journal for publishing 'high quality' research, or the journal impact factor, an average measure of journal citations. Anyone with a basic understanding of numbers, or even a little bit of common sense, should be able to see why this doesn't really make any sense either. Journal-level factors have no logical relationship with anything on the individual level, and even the common thinking behind this is backwards, as in reality it is journal brands that are built by researchers, and not the other way around.

So how do we fix this?

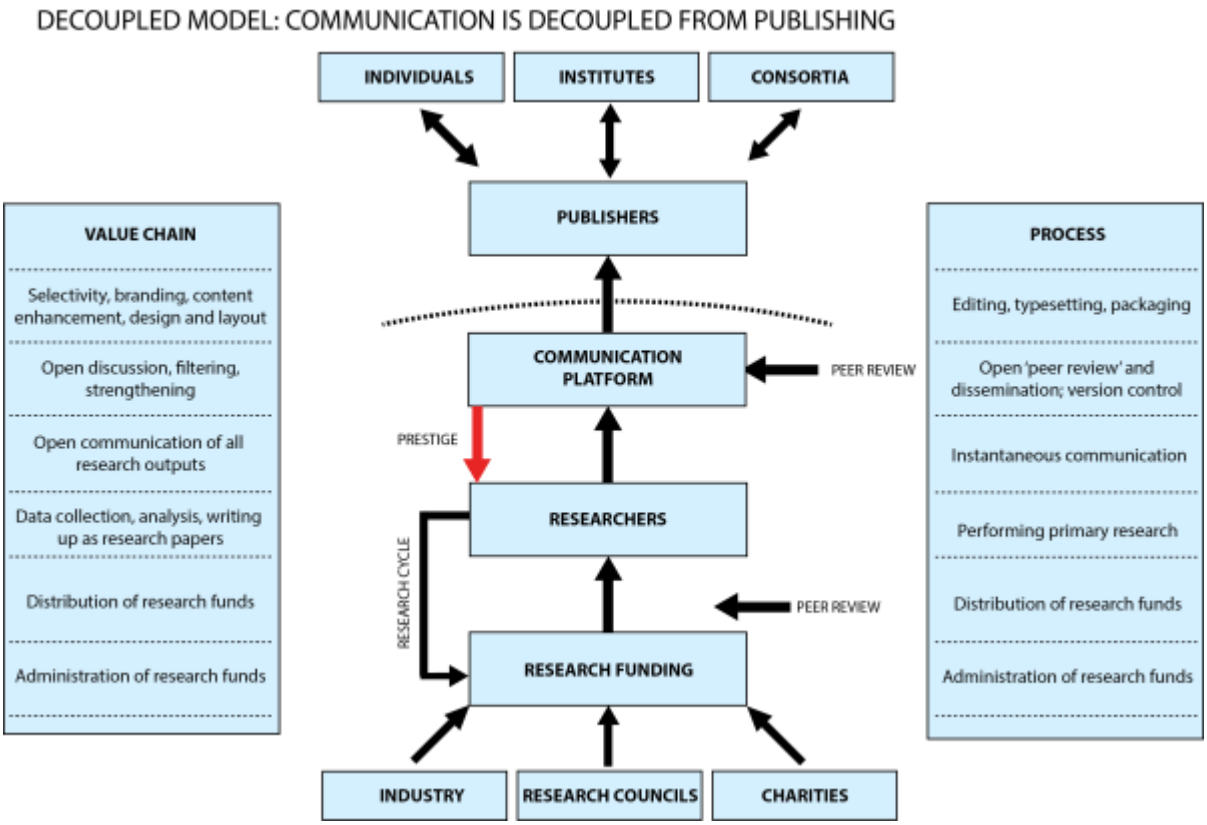
So, any way of fixing scholarly communication has to accommodate these two factors: **moderation** and **evaluation**. How would a communication platform look based on Web 2.0 technologies that had to do both of these things?

Content moderation can be done via a simple community-level assessment. Let's imagine a simple platform where researchers openly share content, similar to any of your favourite 'social networking' sites. Content on the platform can be upvoted, rated, ranked, and commented on, all at different levels or in different ways. Examples of how this works as a form of community-led moderation include Reddit, Amazon, and Stack Exchange. Low quality content receives lower 'scoring', lower ranking, and overall less attention. Vice versa for higher quality content.

This is basically the same as traditional peer review, but moderated by communities and as a process subsequent to the initial sharing of content. The same potential issues to do with anonymity/identification still exist. The properties of any moderation system should be openness, inclusivity, and transparency.

In terms of prestige, this could also be facilitated by communities through the same platform, for example through the same simple voting/ranking system (think Reddit) or a badge system of some sort, like we see on Stack Exchange. Prestige then is based on engagement within the platform, and the value of this engagement to the community.

The importance of these things is that it puts the two most powerful aspects of the communication system in the hands of the research community. Moderation and evaluation become **decoupled** from publishing, and instead tied to communication and community interaction. That represents a huge shift in how we do research.



A proposal for a decoupled model of publication, where communication of research is independent from any publisher

Pros of the decoupled model

- Greatly reduced costs of communication, can be reinvested into research/institutions (good for everyone except publishers)
    - No subscription fees, no article-processing charges
    - The only cost is the hosting and maintenance of the platform
    - Publishing industry sustained by competing to publish content in traditional 'paper' format
- All research has the chance to be openly discussed, moderated, and evaluated
- Version control to update content. Think GitHub.
- Publishers not in control of content; power is in the hands of researcher for dissemination and re-use
- Prestige conferred through research communities on the platform
- Evaluation is moderated, transparent, and accountable
- Relies on the strength and engagement of research communities to function

- Copyright retained by researchers

Cons of the decoupled model

- Moderation and validation occur subsequent to the communication
- Massive decrease in publisher profits
- Relies on the strength and engagement of research communities to function

As always, what am I missing? I'd be happy to update these images in the future (feel free to share btw – all content on this site is CC BY 4.0).

And the rich get richer..

The Gates Foundation and the American Association for the Advancement of Science have reached a new deal regarding how Gates-funded researchers can publish Open Access with the Science series of journals. Yippeeee! Progress from both publishers and funders in implementing OA for "high quality" research (their words, not mine), can only be a good thing, right?

Well, maybe not.

Value for money?

The cost of this is partnership is $100,000 for one year, in which the Gates Foundation estimate that they will publish 10-15 articles during that time (source). This works out at anywhere between $10,000 to $6667 for each paper to 'cover the costs of publishing'. Which puts each paper at around 2-3 times the industry average (source), more than 5 times the cost per article in PeerJ or PLOS ONE, and even more than the coveted Nature Communications (source), with its high impact/prestige factor.

That's a hell of a lot of money for, well, not too much actually. This is all guaranteed income for the AAAS, it doesn't matter now how many subscriptions they sell or whether that side of the business model entirely collapses, or even if Gates authors choose to publish in AAAS journals.

Overall, the transaction makes very little sense, as all articles in Science can be self-archived immediately upon publication anyway, or after a six month embargo, including uploaded to PubMed Central. That means all the peer-reviewed science, minus the fancy type-setting and copy-editing, is freely available upon publication anyway, without an additional penny being spent by authors or funders.

Will the AAAS offset subscriptions now?

It is not clear whether this money will lead to a proportional reduction in subscription costs for individual journal or as part of package deals – i.e., it is likely that this content will still have to be paid for again as part of the subscription packages that the AAAS negotiates with subscribers.

AAAS believes it publishes high quality research, when in fact the opposite has been shown to be true, that it produces the lowest quality and least reliable of almost any journal out there (source). So, this is not really $100,000 to support Open Access. They could have given it the ASAPbio movement to help fund a centralised pre-print server, for example, and used it to support the advancement of science much more effectively.

What this is at the end of the day is payment to not charge access to those articles which would have been freely available 6 months after publication anyway – this is all APCs are, really. That doesn't seem very sensible to me. In fact, it seems kinda counter to some of the more recent progressive movements from the Gates Foundation recently, as it gives credence to the concept that 'high impact' journals, or 'glamour magazines' still matter and are worth paying more for as a result. As such, it is sustaining a high-APC model of publishing, as well as the chase for fake journal branding points that we all love.

A much stronger position from the Gates Foundation would have been to demand a zero-embargo period on all of their funded research, and let the AAAS keep the walls around 'their' version of articles while liberating the post-print at the same time. Clearly, everyone would still purchase the final version anyway, as *Science* offers such article-level value that the basic, peer reviewed research is worth very little, relatively. Right?

So, to conclude:

- Not entirely clear what this money is being spent on;
- Missed opportunity to take a real stand against publishers at the funder-level;
- AAAS again demonstrates that they are all for public access to research, but only if you pay through the teeth for it.

Note, this is not the first time we've noticed the AAAS being a bit rubbish about Open Access..

Illegal file hosting site, ResearchGate, acquires massive financial investment.

ResearchGate is a platform where its users, primarily researchers, routinely engage in massive-scale copyright infringement of published works.

It was announced this week and covered in a series of high profile venues, including the New York Times, Business Insider, TechCrunch, and Research Information, that the platform had

acquired $52.6 million in funding from a range of sources including the Wellcome Trust, Bill Gates, and for some bizarre reason, Ashton Kutcher.

Financing massive-scale copyright infringement

The platform boasts that 2.5 million published outputs are uploaded by its users every month, equivalent to around the total number of published scholarly research articles each year. The site claims to have around 100 million published articles, which is very impressive seeing as only around 20-25 million have ever been published Open Access.

Now on the face of it, this might seem awesome, as it is vastly increasing access to published research. But it is actually hugely problematic, as recent research reveals. Based on a random sample of English language articles drawn from ResearchGate, the study showed that:

The key finding was that 201 (51.3%) out of 392 non-OA articles infringed the copyright and were non-compliant with publishers' policy.

While this sample size was small, there is no reason to think that the same cannot be said if we scale up to consider the entire corpus of articles shared on RG. This means that around half, or approximately 50 million, research papers on RG are most likely illegally hosted.

Every researcher is aware of RG spam, often with emails requesting directly that authors upload a version of one of their published papers. So, while RG is itself not committing the copyright infringement, it is certainly enabling and often encouraging it, therefore being directly complicit in this on an enormous scale.

The problem here is that the vast majority of published research papers cannot be uploaded online legally, even by the original authors. This is because researchers are often forced, albeit often without their knowledge or awareness or understanding of the implications, to transfer full copyright over to publishers in exchange for having their research article published.

The ethics or questionable practice of this aside, this means that for around 75% of all research articles, the published versions cannot be legally posted online. The manuscript versions prior to peer review (preprints) can often freely and without restriction, and the often unformatted but peer reviewed versions (postprints) can, often with embargo restrictions.

With RG though, it is often not these versions which are shared, as the above research demonstrates: "*...the majority of non-compliant cases (97.5%) occurred when authors self-archived publishers' PDF files (final published version)*."

This is all of course not complicated or an issue with Open Access publishing in which free, unlimited and unrestricted sharing is completely acceptable and encouraged.

Why is ResearchGate so popular?

Posting to RG is no more difficult than freely posting to an institutional repository, yet with allegedly more than 12 million members on the platform, publishing there is clearly appealing. Academics precariously use it as a professional advertising tool, and in an academic environment where egotism and self-marketing is rewarded more than sharing, it is easy to perhaps see why using RG is more popular than doing things the legal, and often bureaucratic and expensive way.

When questioned about this massive scale illegal file hosting, RG can simply wave their hands and say it has nothing to do with them; instead, fault lies with the choices of their members.

Search engine of choice, Google Scholar, also harvests content from RG. This means that researchers' most popular way of research discovery is also enabling massive scale illegal access to research. I doubt GS would be half as popular if it didn't consistently facilitate access to illegal content, as it's a pretty rubbish search and discovery platform on the face of it.

In the meantime, RG can keep using this illegal content to enhance their data analytics, which is perhaps more of an issue than what they then choose to do with such data as a for-profit company. They can, and do, provide a simple statement upon uploading articles, to make sure that they are the legal versions. But this is not monitored or enforced in any way, and if it was in any way effective as a preventative measure then we would not see such massive scale illegality on the platform. This issue is so much greater than the question of whether or not a for-profit entity should be engaging with academia.

RG boasts that its user base comprises more than half of the global research community: "*According to Mr. Madisch, the social network has signed up 12 million scientists, or roughly 60 percent of all such potential users worldwide*."

A system-wide access/copyright/education disaster

This means the problem comprises three major parts:

1. The vast majority of researchers engage with a platform in which about half of the core article database is illegal.

2. Those same researchers don't seem to care or be aware of this.

3. ResearchGate also does not seem to care or be able to be held accountable for this, as the infringements are from their users, rather than the company itself.

Which means that active engagement in illegal sharing of scholarly works is now so commonplace that even companies that facilitate this can gather millions in venture capital, with no one even raising this issue. It also demonstrates that the vast majority of researchers either do not care or are not aware of the issues of copyright and scholarly publishing, as Richard Poynder pointed out recently.

It looks like the future of ResearchGate will be in using this vast and illegal corpus of data to focus on advertising to its user base, according to comments from its CEO.

The nature of these investments is also presently unclear. Does the Wellcome Trust now own a stake in ResearchGate, and how does this align with their charitable aims and other investments, such as Wellcome Open Research, a fully legal initiative?

Why has legal action not been taken?

Seeing as publishing companies like Elsevier are actively pursuing other illegal article sharing platforms like SciHub, and often with an enormous media campaign following each step, it seems quite surprising that they have not taken additional stronger action against ResearchGate, other than the few thousand takedown notices they issued several years ago.

SciHub claims that it is "the first pirate website in the world to provide mass and public access to tens of millions of research papers", providing access to 58 million articles at the present, all provided by a global user base. Well, this isn't really true, is it. ResearchGate has been around longer (2008), and is in effect a pirate website of almost twice the size, now with the backing of major investors.

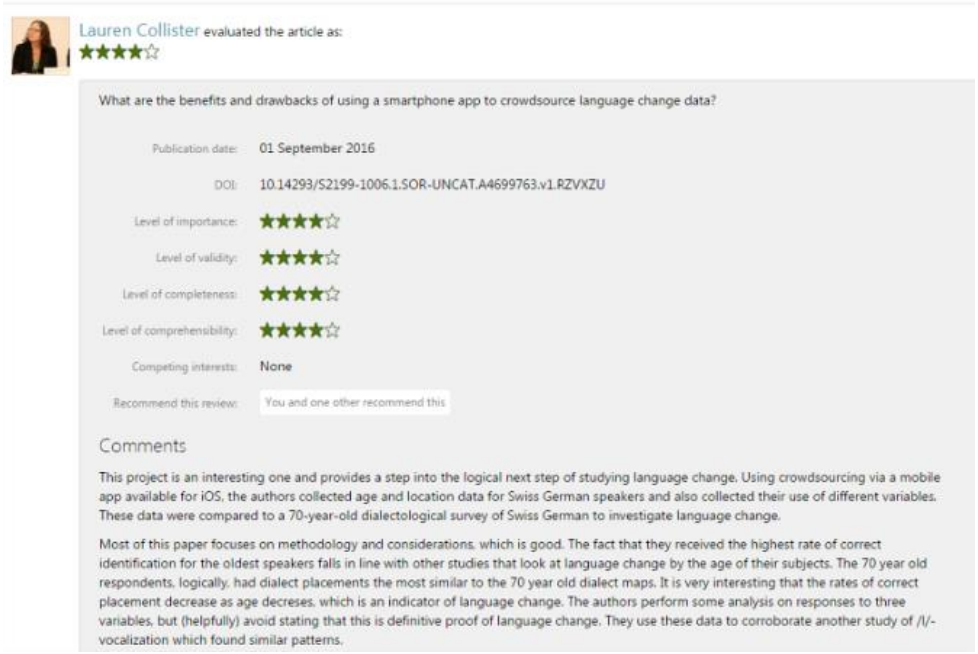
The difference is that SciHub is run by one frustrated student, whereas RG emphasises the massive-scale problem with access to knowledge through 12 million researchers as members. SciHub is the same as RG though in that it is the vast number of users who commit the copyright infringement, with both platforms simply acting as the hosts for this activity.

Furthermore, this also means that this is 12 million researches who probably think they are 'doing Open Access' by sharing their work on RG, whereas actually the opposite is true. By doing this in an illegal manner, they fail to commit to OA in a legitimate, integrated, or sustainable way.

What would happen if ResearchGate shuts down tomorrow?

What are the barriers to post-publication peer review?, LSE Impact Blog.

At ScienceOpen, we have over 28 million article records all available for public, post-publication peer review (PPPR), 3 million of which are full-text open access. This functionality is a response to increasing calls for continuous moderation of the published research literature, a consistent questioning of the functionality of the traditional peer review model (some examples in this post), and an increasing recognition that scientific discourse does not stop at the point of publication for any research article.



Post-publication peer review at ScienceOpen in action!

In spite of this increasing demand, the uptake of PPPR across different platforms seems to be relatively low overall. So, what are some of the main reasons why researchers might feel less motivated to do PPPR, and is there anything we can do to increase its usage and adoption as part of a more open research culture?

What even is "post-publication" peer review?

There is a general mentality among researchers that once research has been published, it has already "passed" peer review, so why should it need to be peer reviewed again?

In reality researchers spend their time "peer reviewing" research by reading papers critically, re-analysing their data, checking methods, running someone else's code, and synthesising information across articles to add new context and information. We don't even realise it most of the time, as this is just the subconscious way in which we perform research on a daily basis. Traditional pre-publication peer review is just formalising this part of the natural research process.

One problem is that, sadly, much of this important context and evaluation remains locked away in notebooks and hard drives, either lost to research forever, or delayed until it is published some years down the line. Which is a shame, because the value of this process goes largely unrecognised.

PPPR, then, is about making parts of this everyday research process more public. It's about taking the evaluations and critiques that researchers, and others, perform and adding that context to published research articles.

Everyone benefits from this process – authors gain feedback and important criticism of their work; external researchers gain a deeper insight into research; and we all increase our general understanding of a topic. It's the same as any other "social evaluation" platform like Amazon – we use reviews to refine our knowledge of a "product", or research paper, compare across "products", and ultimately use this for advancing our own research as part of a wider community.

Barrier: PPPR takes too much time and effort

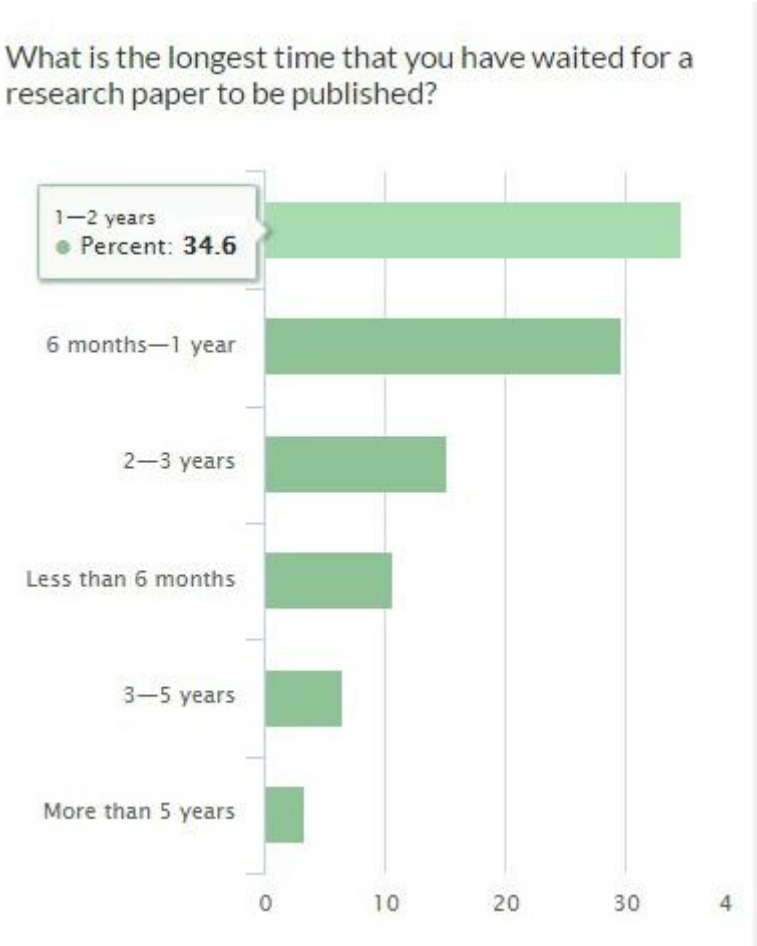
Almost everyone in research, be they Master's students, PhD students, Postdocs, Professors, or technical engineers, are overworked, underfunded, both, or even unemployed. For this reason, it is quite understandable why many turn down extra unpaid work (i.e. peer review). Never mind that traditional peer review already takes up a lot of time and effort, and, despite great initiatives like Publons, still largely goes unrecognised across the board. The same still applies to PPPR too, because it's seen as an additional workload on top of "normal" peer review.

Research has shown that academics are in one of the most overworked professions out there. There is never enough time, with research, teaching, drinking coffee, writing papers and grants, and all the other demands on researchers, to do anything that isn't top priority.

So how do we resolve the PPPR versus time conflict?

Potential solutions

Well, peer review doesn't have to take a long time. It can, depending on the paper, but it doesn't have to. To do a thorough peer review can sometimes take days. But we've all had an experience of that peer review which took eight months to be completed, and in the end came back as half a paragraph of text recommending the smallest of modifications, and clearly the reviewer had only spent half an hour reading the paper before responding.



A third of researchers have waited more than a year to get a paper published. Isn't it about time we found ways to speed that up? (Source)

The current system of traditional peer review is more time-consuming, causes publication delays, is more costly, subjective, secretive and exclusive, and overall vastly more inefficient than any post-publication process will ever be. Every argument levied at PPPR can be said of the traditional process too, and that is especially true of the "time and effort" angle.

But to make things much simpler, PPPR doesn't always have to be a completely detailed or comprehensive analysis of all aspects of a research article. If enough people comment on different parts of a paper, that eventually will form a complete whole. We know that at least some level of quality control has already been performed in the first place to get an article published – it's our collective job to increase that quality where we can. And not every article has to have PPPR – it just has to be injected by the right person for the right article at the right time.

A peer review doesn't have to cover all aspects of a paper to be useful either. If you're an expert in data analytics, comment on the data analytics section of an article. If you're a bibliographic wizard and notice that relevant articles are missing from the context or discussion, leave a peer review or comment pointing out the issues.

Did you find a flaw in the data or code? That's a peer review – make it public. Is someone's method awesome, and work really well? That's a peer review – make it public. Is someone completely ignoring an important subset of research for some reason? That's a peer review – make it public. I think you see where this is going now.

The point is that the detail of peer review comprises a spectrum, and as a result does not always have to be time consuming or a huge effort. What is important is sharing your knowledge in a timely manner that adds positively to research discourse.

Barrier: lack of motivation and duty

We have written before about how editorial control will always be a critical aspect of any open peer review system, including PPPR. Editors are required to solicit peer reviews in a timely fashion (and often send numerous reminder emails), as well as provide the sort of "prestige factor" with being requested to review an article, as a direct acknowledgement of your expertise in that field.

Among the other activities researchers have, PPPR might therefore be seen as relatively important, but not yet necessary. With increasing questions arising as to the validity of the published research record though, it is only a matter of time until PPPR is seen as a way of facilitating post-publication moderation and correction of research articles, and becomes as commonplace as using Dropbox or GitHub to aid the overall research and communication process.

Potential solutions

Therefore, PPPR could, and probably should, be viewed more by institutes, research funders, and researchers themselves as a relevant source of quality control to reflect the natural state of academic publishing – that published research is never perfect. Simply being published is no guarantee for the "correctness" of research, or longevity as such. PPPR forms an essential part of the recognition that research is a continuously evolving process built upon discretised "discoveries" published as research papers.

Furthermore, due to the competitive nature of academia, it is entirely possible that some researchers have a mentality like "why should I help a competing researcher improve their research?" This is entirely consistent with a system in which mutualism or symbiosis is rewarded less than personal or individual progress, due to limited resources and a highly competitive work environment.

If the research record was perfect because it has "passed" peer review, we wouldn't need to keep doing research – indeed, it is the imperfection of peer review and the published record which motivates us to continue to do research! A good researcher never blindly cites the research without critical evaluation of it first – that's our job. That citation is an indication

that a researcher (i.e. a peer) has evaluated (i.e. reviewed) that article subsequent to its publication.

One thing that pops up all the times in discussions of peer review is that many researchers see traditional pre-publication peer review is part of their duty as researchers – not to the journals, but to their research community. The same is exactly true of PPPR too – continued evaluation of the published record is part of that same duty to your research community.

If researchers begin to perform continuous quality control as part of their responsibility, then perhaps we will see an increase in trust levels in published research again, a factor which is all too critical in the current global social and political environments.

Barrier: Too many alternative methods or platforms of communication

PubMed Commons, ResearchGate, PaperHive, and PubPeer are just several examples of platforms or tools that allow you to perform some form of post-publication commentary on research articles. When multiple copies of papers exist across multiple platforms, it is possible to have different comments appearing on different sites but not others. It's also possible for researchers to suffer from "platform fatigue" – too many competing websites trying to achieve the same thing, and fragmenting the landscape by doing so.

Additionally, if someone has a genuine critique of an article, they might wish to make it "formal" by publishing a response commentary, and get the recognition that comes with that as an additional publication. This mode of communication is probably more appropriate though only when serious theoretical or empirical flaws have been found in published research.

The problems here stem from a lack of comprehensiveness, interoperability, and critical mass uptake as the *de facto* platform for PPPR. The result of this is a mess of different platforms having different types of commentary on different articles, or sometimes the same ones, none of which can be viewed easily in a single, standardised way. That doesn't seem very efficient.

Potential solutions

We thought pretty deeply about this issue at ScienceOpen too, and this is why we've made our platform as integrated as possible with other parts of the scholarly communications infrastructure. We have partnered with other key players such as Crossref and ORCID to make sure that when you perform a PPPR on our platform, it doesn't conflict with your other profiles, but works with them instead.

Each PPPR at ScienceOpen becomes a "publication" in itself, moderated by ORCID, accredited by Crossref by assigning each one a DOI. We attach a CC BY license too just to make sure each is viewed as a completely open publication, easily citable and can even be integrated further

with your Publons and ORCID profiles. As far as alternative platforms for PPPR go, that's about as integrated, interoperable, and accredited as you can get!

Barrier: appearing confrontational in public, biases, and abuse of power dynamics

Some researchers, especially those in more junior positions, are afraid that if they are vocal or negatively critical about another researcher's work in public, especially one who is more senior, then there could be a potential backlash against them for it. Documenting this sort of power dynamic abuse is difficult to see or measure, but certainly impacts upon earlier career researchers, who are perhaps those more willing to engage in more open research practices. At the moment, it is a shame that this sort of behaviour exists within research environments, and rather than being addressed at source is being used to constrain different parts of "open ecosystems". Rather than using bad behaviour as a reason for remaining "closed", we should be asking why we don't address poor behaviour as a systemic issue where it exists, especially during traditional peer review processes.

One major issue with the current system of peer review is that it empowers bad actors with position and status to marginalise those with relatively less power. This means that the inverse is also possible too, that some people might use PPPR to be deliberately confrontational in public, and to talk down to or intimidate their junior peers. Therefore, any alternative or complimentary system has to reduce or minimalise this negative dynamic, make sure that an accountability process is inbuilt and managed, and that marginalised communities feel invited to participate. Too many social platforms already have comments that are negatively geared against women or minorities, and therefore any PPPR platform has to have a mechanism in place to reduce or negate this entirely.

Potential solutions

At the moment, there doesn't seem to be any consensus on how to resolve this issue. There are arguments for increasing anonymity (blinding peer review) for protection, and also increasing openness to expose bad behaviour and make researchers more accountable. These arguments apply to both pre- and post-publication peer review, and at the moment there is generally insufficient data on the impact of anonymity on PPPR.

At ScienceOpen, we have found that all PPPRs performed to date on our platform have been civil and constructive. All reviews have been named, as this is a pre-requirement due to the integration with ORCID. This doesn't mean that we have managed to eliminate all potential biases and issues, but it at least seems to be working better than the traditional system, in which the many biases still largely remain (for example, see a recent study on gender bias here).

We recently had a case were groups of students tested the reproducibility of a paper on our platform. Each post-publication peer review was courteous, detailed, and constructive. The author of the paper responded that they were delighted with the attempts to critique and

improve their research, with no ill side effects to those performing the evaluations. This is how PPPR should be: a progressive, open, and above all civil and professional dialogue.

Barrier: No-one reads or uses PPPRs

Further questions arise as to the actual readership of PPPR comments. What if substantial issues are raised, and the authors just ignore them? Are they going to go back and address comments on research that might be years old, and funding has completely run out on? Commitment to perform a PPPR on an article might be difficult if a guaranteed reciprocal commitment to address any issues raised is not given. One problem here, as pointed out by others like Lenny Teytelman before, is that a lack of version control over the vast majority of the research literature makes actually "adapting" papers to include post-publication comments impossible. This is because, despite the functionality that the web provides us, the vast majority of research articles are still published as static "papers", with single versions that are considered final and uneditable. What we have then is not evidence of a problem with uptake of or demand for PPPR, in this case, but evidence for lack of an incentive to do PPPR as there are very little real consequences of doing so.

Is anyone even going to read PPPR reports, or are they just going to gather dust as footnotes? How many researchers even have heard of PPPR, or know what it is or what it is for? So, the question then becomes are PPPRs really even that useful, academically? Why should anyone spend their time trying to improve a research paper if the authors won't or can't actually then improve it? PPPR therefore becomes a communications issue, based around cultural norms and practices within academia.

Potential solutions

Possible ways to resolve this include trying to maximise PPPR reports' visibility and reusability. At ScienceOpen, we are similar to other journals like F1000 Research in that PPPRs are presented on the same pages as the articles themselves. Reviews are clearly presented with summary statistics, names, graphs, data tables, and DOIs to make them as visible as the research articles themselves.

Another solution is for publishers to start using version control with peer review, and provide updated versions of papers with successive rounds of peer review. This is what we do at ScienceOpen Research, and also at other journals such as F1000 Research – my personal experience is that this is a far superior method of publishing than any traditional model. However, for now, the vast majority of the research literature requires overlay (e.g. PubPeer) or aggregation (e.g. ScienceOpen) features to directly link PPPR to papers so that readers can easily see them, until the immense value of version control is recognised and it becomes more widespread.

How can we make PPPR on ScienceOpen more attractive?

We see post-publication peer review as a way of making part of the standard research process more useful for everyone, providing additional context to published research, improving the overall research process, and demonstrating the knowledge of individuals in an impactful way. What we facilitate is the publishing of critical post-publication evaluation of research at any level. At the present, this can be done for almost 30 million article records on our platform, and this number is growing every day!

The important thing is attaching post-publication evaluation to the articles themselves. Blogs and other social commentary are almost valueless and lost into the void if not linked to articles. It needs to be a permanent record to be of value to future research. Next time you're commenting on a paper on a blog, Facebook, or Twitter, consider posting it as a PPPR instead and making it a permanent and more valuable contribution to the research record.

We showed recently the immense power of publishing replication analyses as post-publication peer reviews on our platform, both as an analytical training mechanism and as a way to critically progress research. We even upgraded our PPPR features so users can now:

- Add images and tables to reviews
- Register reviews in CrossRef through DOIs
- Add reviews to Publons and ORCID profiles.

But what else can we do to encourage the uptake of PPPR? For example, what if we allowed everyone to comment and rate articles, but just like with blog post comments we allowed authors to decide on whether or not to make that feedback publicly visible? Would it completely go against the institution of PPPR? What about changing the ORCID moderation of who can perform a PPPR (users currently need a minimum of five records attached to their ORCID profile) – is that fair? How can we make PPPR on ScienceOpen more inclusive so that everyone feels like that they can contribute equally? How can we make it so that reviews are even more recognisable?

Should biologists cite preprints?, The Biologist.

In 1990 the ambitious CERN computer scientist Tim Berners-Lee built the World Wide Web to help researchers share information rapidly.

Just a few months later, arXiv (pronounced 'archive') was developed as a centralised web-based network for the maths, computer science and physics communities. Nearly 30 years on more than 8,000 'preprints' – academic articles that have not yet been formally peer reviewed – are submitted to arXiv every month.

In the life sciences around 1,000 papers are submitted as preprints every month. Several developments have catalysed the use of preprints in the biosciences, including bioRxiv, an arXiv mimic, and the community-led ASAPbio initiative that encourages the productive use of preprints. Large research bodies including the NIH, MRC and BBSRC now both allow and encourage the use of preprints in grant submissions.

In spite of this growth there is still resistance to preprints. One major barrier is the question of their citation as scholarly works. Some researchers have claimed that it constitutes bad scholarship and that preprints, due to their preliminary nature, are no different to other 'grey literature', such as non-peer-reviewed reports, articles, correspondence etc.

This is part of our academic culture where typically only research that has been explicitly peer reviewed, and therefore has a stamp of certification, is cited.

This is actually quite different from other fields. According to Google Scholar, four of the most highly cited 'journals' of all time in maths and physics are arXiv subsections. In these communities, a preprint is considered to be an establishment of priority for that research, a starting point for further discussion or investigation. In the life sciences, preprints have not yet gained this status.

Attempts to close this value gap have largely focused on making preprints more citable from a technical perspective – for example, provision of better metadata, persistent identifiers (DOIs), and even the look and feel of a traditional journal article. However, researchers don't avoid citing preprints because it's technically difficult. They don't cite them because they are not deemed worthy of citation.

What researchers rely on are journals (and peer review) to take on the responsibility of telling them what is citable. Preprints tell us that the responsibility of the citation lies with the citer, and for some researchers this is scary. However, evaluating the quality and context of research is part of our job.

There are good and bad preprints, just as there are good and bad papers. As research communities we should not be using journals as an excuse to absolve ourselves of the ability to think critically.

I recently established paleorXiv, a community-led preprint server for palaeontology research. It didn't take long for this to spark a lot of discussion, and I even received an email from a senior researcher emphasising fears that it might be used by creationists to 'get one over' on real science. Yikes.

We are still just at the beginning, and there is a long way to go. The biosciences are incredibly diverse, with many subdisciplines – each with its own set of community norms and values. It is understandable that a 'one size fits all' model for preprints will never work across the entire life sciences.

For paleorXiv, we decided to create community-oriented submission guidelines to engage with researchers and help address many of their concerns, particularly regarding preprint citations. To me, the most important is: "Please exercise the same care and judgement you would use for any research output when it comes to the citation and re-use of preprints." That's just good scholarly practice.

How 'broken' is academia, and how can we fix it?

In every coffee break conversation, you hear murmurs of a 'broken academic system'. Hallways whisper secret conversations about the latest case of professional abuse, the tenured professor still writing papers on a type-writer, and the grad student that mysteriously disappeared just 6 months in.

I'm going to try and outline here what I have seen in my experience and through many discussions with an enormous variety of people about what the most pressing issue in the current system is.

It's all about power, and the abuse of it.

Academics who are embedded in a position of status or power must have successfully navigated the academic webways, played the game just right, in order to be where they are now. This must be true, based on the virtue of the fact that they are there.

These very same people are those who control almost everything – they sit on your hiring committees, they are the gatekeepers to journals, they review your grants and decide who or what receives funding. They also are the ones with the capacity to create real, systemic, and cultural changes, because they are the ones pulling all the strings.

However, by the very virtue of being successful, they can easily become blind to the faults of the system, because you can't see them as negative when they have worked for you in a positive manner. Because they have overcome obstacles, they fail to see why others cannot in the same way, or that these obstacles impact upon different people in various ways – typically disadvantaging the already disadvantaged most. By definition, marginalised communities are invariably under-represented, but are often the very common and real victims of faulty systems. But when do we ever hear their voices?

Success in academia, or any walk of life, blinds people to the reality of failure. For whatever those reasons might be. How common do we see the attitude of "It's not a problem because it doesn't happen to me." in academia? "I made it here, so others can too."

This sort of ignorance and lack of empathy results in a system that constrains innovation, stifles cultural adaptation, and defines inertia as the norm through a system of fear. Fear because you can't challenge this status quo, as it's the members of it who are going to decide

if your paper gets accepted, you get hired, or you get that grant. They decide if you are able to pay your rent and feed your family.

This reality is a huge problem, as those who wield this power won't always do so. They'll try to for as long as possible, but it is the grad students and postdocs (early career researchers, ECRs) who will inherit the system. But they aren't having much say in what it is they will inherit.

Students of today are growing up in a very different web-powered digital world. This world is all about creation, innovation, and the freedom to share knowledge and ideas. But ECRs are penalised for speaking out and challenging and creating, because at the moment they have no power in the system. You can look at the table and watch the game, but you don't have any chips so you can't play.

A consequence of this is that diverse voices are not invited, welcomed, or recognised to be at the tables where the important decisions are being made. The top of the system, where all the power is, represents a culture of replicas, of clones, the same demographic who know how to play the system to win the game. It will rarely be success based on individual prowess or skill, but a process of a thousand small events with a thousand different players that were leveraged at the right time, with just the right amount of luck, that manifests itself as personal achievement and results in acquisition of power.

It's these very same people though in power who don't want to undermine the foundations of their own success. It makes perfect sense – that's human nature. A researcher would have to have a serious foot-shooting fetish to point out the flaws in their own achievements. But this means that the 'elite' by default choose ignorance over empathy, over generational sustainability, over using their power selflessly to help others.

There are some people at the top who have gained better awareness, and who listen to others and try to induce positive change. But they remain a minority, and we as a culture and a community have to do better to increase social mobility and increase engagement that transcends academic hierarchies.

One solution to this is to have grad students and postdocs better represented in the places that are deciding the future structure of academia: every hiring panel, each grant committee, engaged in advisory roles for every policy process.

If we do not do this, we are left with the very same people who won the long game dictating the rules for future students based on their own minority experiences, rather than the unheard and unseen majority. All the time, we lose our best and brightest as they become disillusioned with the system, and are chased out for one reason or another – just another leak in a very patched-up pipeline.

What I want to see more of is senior researchers listening more to ECRs, to their experiences, their problems, their requests. I want them to embrace empathy for those who haven't won the game, or refuse to play it. I want them to use this to build a better future for everyone that breaks down power dynamics, embraces diversity and encourages equity, and creates a better environment for innovation to flourish without fear.

Let us be brave and challenge the status quo, let us create, let us think outside the box. Isn't this what research is supposed to be about, after all?

Note: Parts of this discussion are chopped up on Twitter here.

Edit: I'm much less interested in responses to this about how the system has benefited people (i.e., the "It's worked for me so what's the problem" mentality). That's not what this is about. I'm interested in finding out why it doesn't work or hasn't worked for those who are worse off. #notallacademics, right...

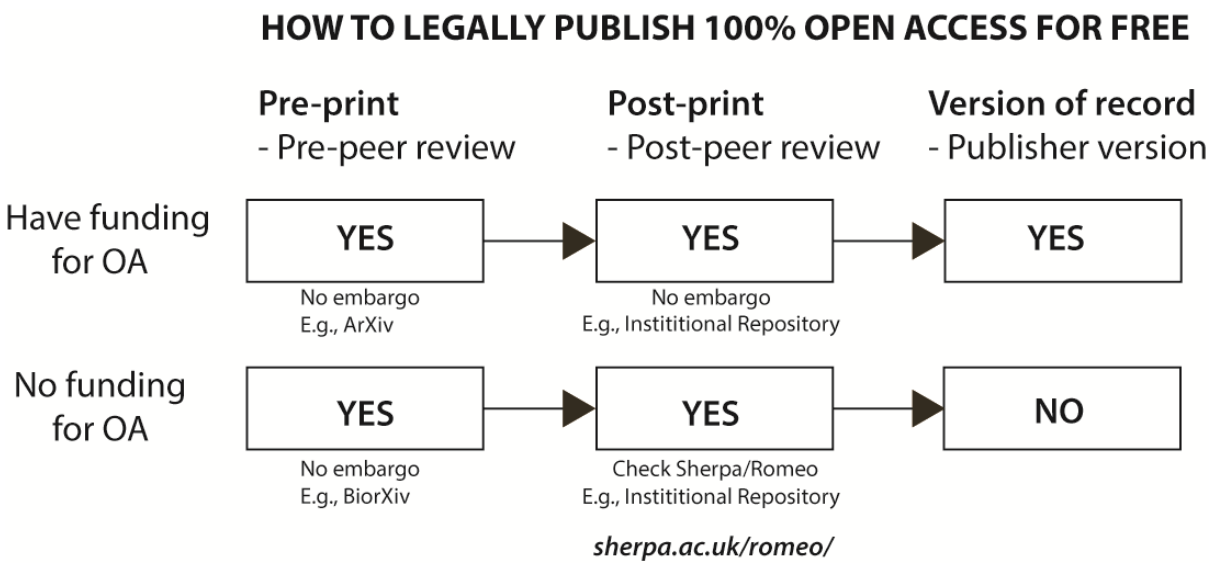
How to make your research 100% Open Access for free (and legally).

Publishing Open Access *can* cost a lot of money. Some journals charge up to $6000 for a single article, called an APC or article-processing charge. While researchers themselves rarely actually have to foot these bills, as their institutes of funders pay on their behalf, this sort of 'pay to publish' model for Open Access creates a vast layer of financial inequality within an already biased system.

But this doesn't have to be the case.

If you self-archive your work, either in a preprint server, which are becoming increasingly available, or an institutional repository, or a general platform like Zenodo or Figshare, then you don't have to pay a penny. Self-archiving is a form of Open Access that is free, easy, and legal.

Here's a sort of flow chart for you to check what you're allowed to legally do in terms of self-archiving your research.



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Doing this is becoming increasingly important as Open Access policies become more frequent, and tools like Unpaywall are developed to make discovering self-archived papers even easier. If you've ever heard the policy term 'Green Open Access', then this is what it is all about – self-archiving.

The important thing to note here is how to check journal policies through the Sherpa/Romeo tool, which is quite comprehensive. Some institutional repositories have inbuilt checks based on Sherpa/Romeo too, to make sure that your archiving efforts are journal-compliant. It's also worth noting the existence of embargo periods, and challenging the need for them.

So self-archiving is low cost in terms of infrastructure, free to authors, and most of all a very simple way to make your entire published record Open Access. All you have to do is upload a PDF of your work, which is where the vast majority of the true research value lies. You can also upload data files alongside this, if needed.

Importantly, this means that researchers, and in particular those who are early-career researchers, can publish in often paywalled journals that they 'need' to advance their careers in the current incentive system, and still have risk-free Open Access.

If we self-archive as a research community *en masse*, several things could be achieved.

1. Global Open Access to the research literature will become a reality for a very low cost;
2. Subscriptions to publishers for our own content will be largely redundant as everything will be OA already;
3. We create the basis for building tools, like Unpaywall, that can leverage the power of massive-scale access;

4. We save $billions every year from university libraries that can be reinvested into students and open scholarly infrastructure;
5. We make the need for quasi-legal entities like SciHub and ResearchGate to become redundant.

Questions?

Why Unpaywall will be a game-changer.

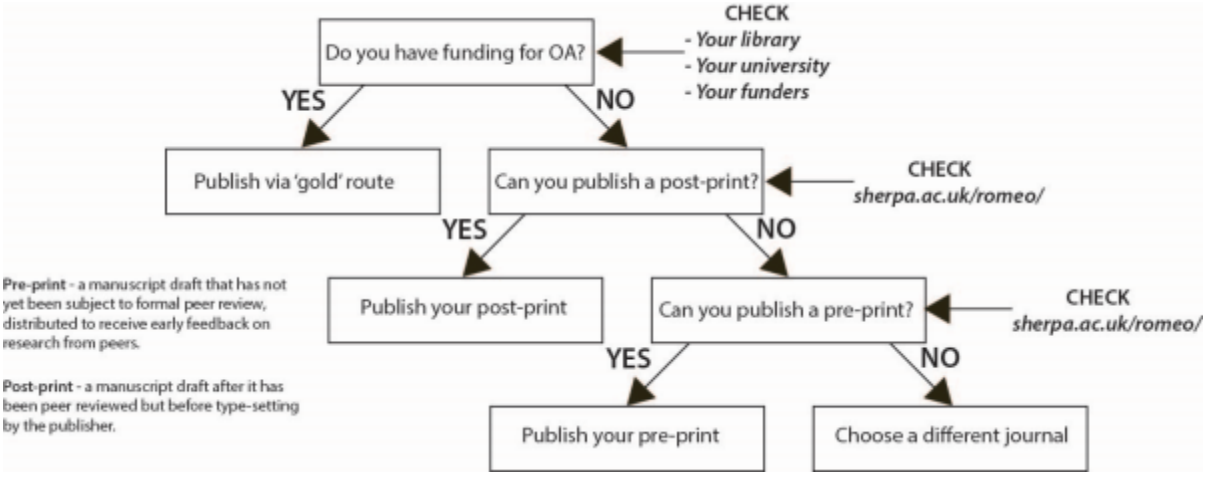
Yep, sorry, we're going to keep talking about this stuff, because it's something worth talking about.

Recently, a new tool has come out, from the makers of OADOI and ImpactStory, that allows users to 'jump the paywall' and access research articles for free. It's called **Unpaywall**, and it works by using information contained within papers, such as its DOI, to find legally archived versions of papers (of which there are multiple usually, like pre-peer review, post-peer review but pre-typesetting etc.) from across the Web, and deliver them straight to you. The interface is fairly simple, as it exists on pretty much any webpage that links to a research paper, with a colour code letting you know whether a version is available for free or not. Click away and you're done, simples.

It leverages what is known as 'green open access', or self-archiving, something which is becoming way more common as some research funders mandate it as part of an OA policy, and as we move generally as a research culture from being closed and selfish (for whatever reason) to one of open sharing.

Now, as you might expect, Unpaywall got a lot of nice media coverage, as it's a fairly disruptive technology. But a lot of the coverage was fairly superficial to me, and didn't explore the wider implications of Unpaywall within the current system of research culture and scholarly communications. So, here's a few things that I think are worth considering a bit further (still work in progress in my head too atm).

1. **It's legal and risk-free.** "*We think Unpaywall offers a more sustainable approach by working within copyright law and supporting the growing open access movement.*" (source) Couldn't agree more. This is important as other sites like SciHub, which has around 60 million research articles, are not exactly legal (in many countries) due to the fact that they host paywalled content rather than free versions of it. They also detract from the need for researchers doing OA in a sustainable manner though self-archiving, which is itself a legal, sustainable, and risk-free approach to making all of your work OA for free.



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2. **It encourages a shift in research culture.** Related to the last point above, Unpaywall only works because researchers self-archive their work. At some point, a threshold must be met, whereby so much content is available for free now, that there is no need to pay for subscriptions any more, and library (and individual) budgets become available for more useful things. But to achieve this, researchers actually have to continue to archive their work. And not just future research, but historically published content where available too. This is part of an evolving research culture and academia, whereby sharing and transparency are becoming the norm over traditional 'closed' practices. This means that we as a collective have to do more to understand things like journal/funder policies, what embargoes are and why they exist, versioning of articles and production processes, licensing and copyright, the 'why bother' of Open Access, and the impact this will all have. Self-archiving your work should become as natural a part of the research process as email, Dropbox, making a coffee, and all the other simple things we do, because it really is that simple.

   While Unpaywall does leverage platforms like Academia.edu and ResearchGate, an option which can be turned off, due to the questionable legality of many articles on these platforms we might see more researchers choosing institutional repositories or preprint archives instead. As these things become better maintained and more common, I think we'll see growth away from these platforms and towards integrated 'green' OA instead.

3. **It's free and easy to use for anyone.** Publishing OA still can cost a lot money, depending on the journal you choose and your funding options. Self-archiving is always free for users, and often far easier than navigating nightmarish journal submission platforms. Unpaywall is free, installed into your browser at a click, and activated for individual articles with another. Simplicity leads to popularity, and it is way, way, WAY easier than having to be at a place with institutional access, using a

VPN, emailing authors, using inter-library loan, and all the other work arounds we have for our broken scholarly publishing system.

Anything which is saving researchers time and money is a good thing.

4. **It's integrated into existing infrastructure.** Unpaywall leverages the power of existing platforms as data sources, including PubMed Central, the DOAJ, Crossref, DataCite, Google Scholar, and BASE. It makes all of the magic it does with this available for anyone via their OADOI API, which is awesome. As someone who uses (and works for) ScienceOpen, it also works really well for that, across 30 million article records (and growing), providing in my mind a really awesome alternative to things like Google Scholar.

5. **It can (and will) be combined with the OA Button.** The Open Access Button is another awesome piece of community-led technology that allows users to request OA versions of papers directly from the authors themselves. It too exists as a browser plugin, and could (and seems probably will be) extended to use with Unpaywall so that if it can't find an OA version of a paper, OA Button automatically requests it for you. How awesome would that be?

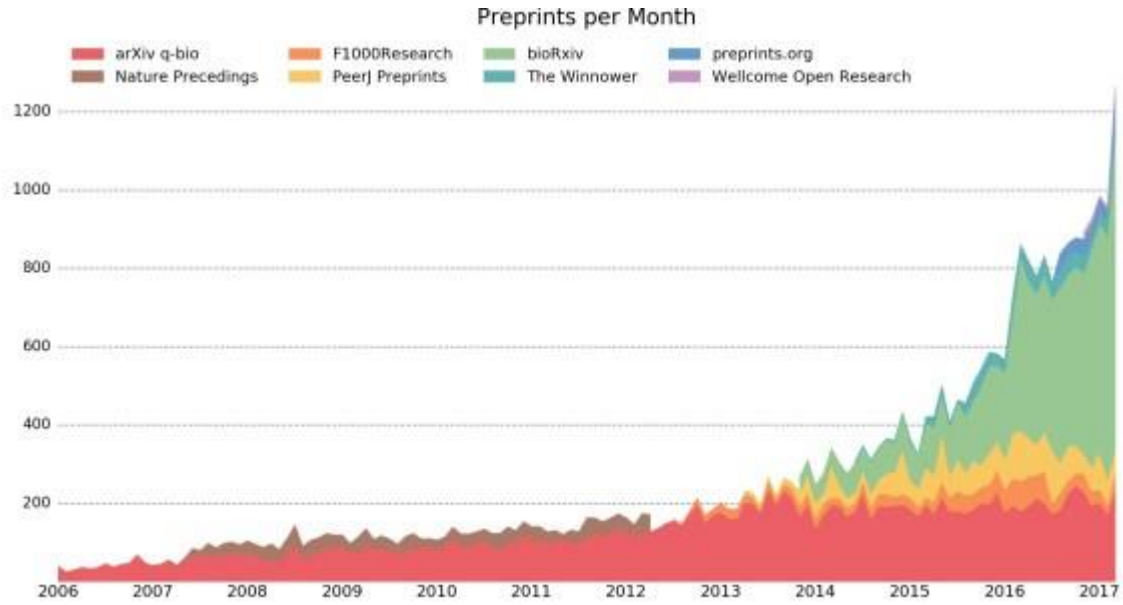
paleorXiv: Now open for submissions!

Open Access is the future of publishing, one way or another. One way that different research communities are doing this is through preprints. These are research articles that are published online prior to the peer review process. The main rationale behind them is that they accelerate research communication, they are free to access, and they are a way to solicit feedback from the broader community while manuscripts are in the formal peer review process.

In Palaeontology, the community has been relatively slow in general to embrace the wider culture of preprints. While the reasons behind this are quite unclear, it would be a real shame to see our field fall behind as others accelerate in their uptake of preprints. For example, in biorXiv, there are only 13 published preprints for Paleontology, and PeerJ Preprints published 25 in 2016 and just 12 so far in 2017.

I think this is fantastic as a start though, and want to thank everyone who has ever published a preprint in helping to get things rolling. Also, it appears that basically none of the fears or concerns people have had about preprints have become real as a result of this.

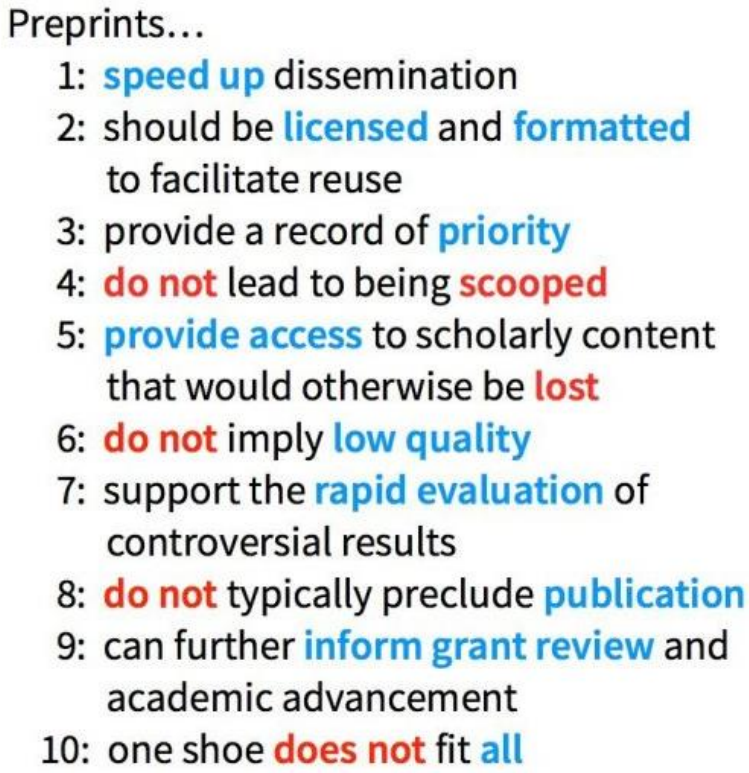
But I also think we can all do a lot better. We publish so much amazing work as a community, but sometimes it takes years for that research to see the light of day, and often still much is still hidden behind paywalls.



The growth of preprints in the Life Sciences. Credit: Jordan Anaya

Recently, the community came together and published a phenomenal piece on the importance of 'open data' in digital Palaeontology. Honestly, it warmed my heart to see this after campaigning for open data for the last 5 years in one way or another. I want to see us do the same thing now for preprints. To come together as a community and accelerate research in our field for the good of everyone.

And now, before the same tired arguments are used against preprints, just please browse the list below.



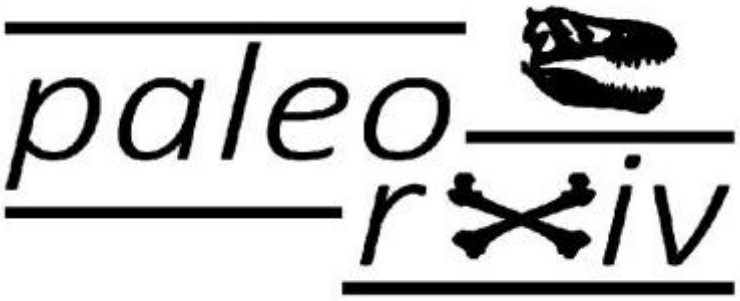
Source.

I should really thank the authors of this paper for doing this for me, as it means the main arguments in favour of preprints already exist in a concise format and I don't have to go through them again.

But consider point 10. Palaeontology is a very niche community and research field. What has worked for the arXiv, socarXiv, LawarXiv etc. won't necessarily be what is best for us. And this is important. I don't want to go steam rolling ahead with this unless it is in the best interests of the community. I need feedback and assistance from you all. Even if you're reading this, and you don't know how to help, simply having a chat with your colleagues (or me) about this can be helpful.

I want to hear from you, more than I want you to hear from me.

It should be noted though that even some of our flagship journals, like Palaeontology, completely support preprint publication. So do Nature and Science, for the record.



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So anyway what we've done is set-up **paleorXiv**, an open source platform for Paleontology preprints, developed in collaboration with the Center for Open Science. It will be launching soon as a way to help encourage the uptake of risk-free, low-cost scholarly communication in our field.

Why we don't need journal blacklists.

A journalist approached me yesterday, and asked the question: "*I'd like to know what you think about [journal/publisher] blacklists and whether you would pay for one?*" I can't reveal too much about the context just yet (see here), but it was regarding the release of a new 'blacklist' this month by a company called Cabell's Publishing Services (see this Twitter thread). Predatory publishing and blacklists aren't something I've dedicated too much thought to yet, so I spent some time processing it and kinda subjected her to a total brain dump of thoughts. See also this excellent post by Cameron Neylon. Here's my response posted in full:

"*So, I would never pay for a blacklist service. I think there are much more suitable services out there that also teach us about issues with publishing, while providing an alternative way of helping researchers decide about suitable venues for publishing. These include the DOAJ (Directory of OA Journals) and 'Think, Check, Submit', or Walt Crawford's 'GOAJ' service (well documented and with open data) for example (also services like PubMed, Web of Science, Scopus, ScienceOpen..). Criteria for inclusion here, and even the raw data, are often provided making them at least consistent and valid, compared to a closed blacklist.*

I think there is also a huge conflict of interest in having a publishing services company operating something like this. Any sort of list should be maintained by and for the scholarly community really. Journals have to be certified or pass a certain quality check, like with the DOAJ, in order to make any sort of 'whitelist'. Blacklists will never be complete as they can

never satisfy this simple criterion. By having a publisher maintain this service, it will be naturally discriminatory against other publishers which challenge them – those which are innovating in some way, thereby stifling any new entrants to the market. Which is exactly what publishers want. This is fine if the blacklist is specifically targeting individuals who are practicing 'predatory' behaviour, but not if those criteria are blindly applied to others who are acting legitimately. Transparency will be key here.

In reality, 'predatory publishers' are a bit of an overblown issue too. For details, see the section 'Deceptive publishing practices' here. A much more valuable thing would be to provide a regulatory service to publishers such as Elsevier, Wiley, and Taylor and Francis, who operate based on behaviours remarkably similar to extortion and racketeering, yet legal, to hold a monopoly over an unregulated publishing market (see here and here). "Predatory publishing" is really just a distraction from these much larger issues in my views. What's the real threat? A handful of bad pseudo-publishers that sucker in a negligible fraction of the research community with very little real, negative consequences ultimately, or the corporate empire that sucks $billions out of public universities each year to sustain its bloated 35%+ profit margins by leveraging the free labour of academics and breaking the backs of our financially-drained libraries. The name of the game here is distraction.

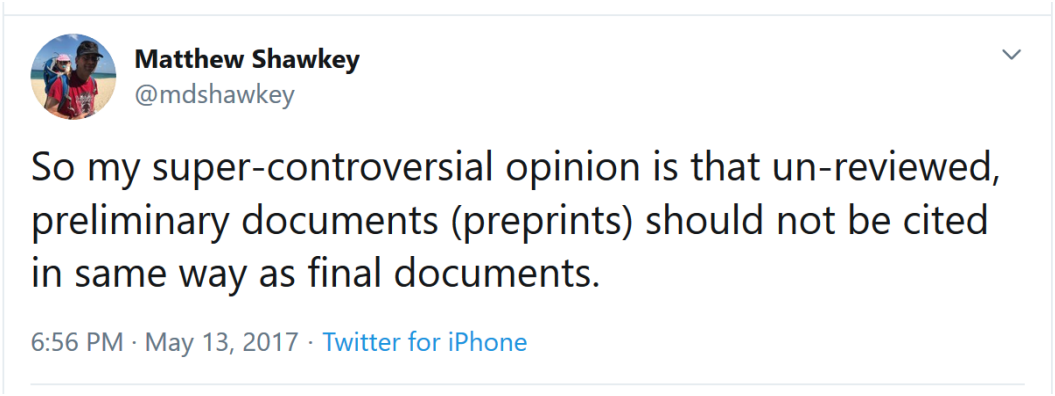
What I would like to see finances being directed towards are more training services to teach those at most risk for falling for predatory publishers more about the ethics surrounding scholarly publishing (e.g., those from lesser economically developed countries, students). More awareness of these issues means that we lose the need for a blacklist of any sort. What we want is an informed scholarly community who are able to make decisions on where to publish themselves – I mean, that's what we should be doing as researchers anyway, making evidence-informed evaluations. If we can't do that, and need blacklists to help, then we probably don't deserve to call ourselves researchers.

I have enormous concerns with any new blacklist too, in that often the traits that define membership to any such list are often opaque and very subjective. Jeffrey Beall was well-known for adding publishers to his list that he simply didn't like, didn't agree on the model with (especially those that were innovating or not based in the western world), or didn't fulfil his criteria for being a 'good' publisher. He was also very anti-open access and antagonistic towards those who supported OA (including myself at one point where I called him out for his aggressive/classist comments towards the SciELO platform). That doesn't sound particularly scientific or professional to me, and isn't something that we should invest in. If Beall is indeed a consultant, as has been rumoured for this, then the same issues with his list can be transferred to the new services. Including that his list got removed due to potential legal or political issues. That doesn't seem too practical, sustainable, or reliable to me either."

I always figure that if you're going to say things in private, you shouldn't say anything that you're not willing to stand by in public. Which is why I post this here for full transparency.

Should we cite preprints?

Recently, Matt Shawkey*, an Associate Professor at the University of Gent, tweeted his opinions about citing preprints in formal research publications, stating that they should not be cited as equivalents to papers that had been peer reviewed. This led to a great deal of interesting discussion around the topic, but scattered all over various Twitter threads. While this discussion has happened many times before, it's always different as new developments and voices get incorporated, which is great!



Source.

The citation of preprints is something of great interest to me, as the founder of paleorXiv, a preprint server for Palaeontology, and because it seems to be against the direction that academia is generally heading towards (e.g., the NIH is now allowing preprints to be cited in grant applications).

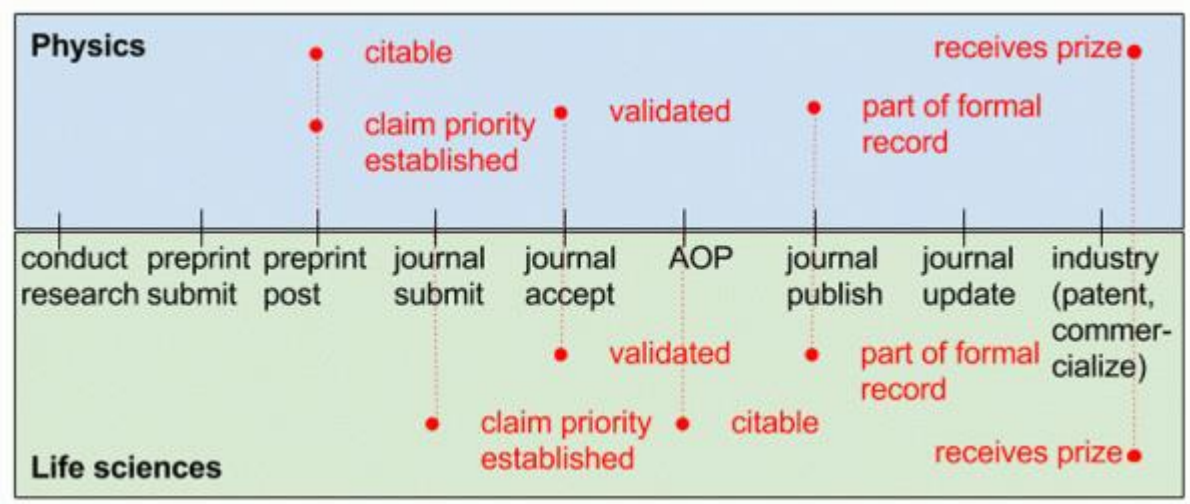
Nonetheless, a lot of interesting and controversial discussion points were raised about this issue, and I think are worth trying to bring together coherently, so that we can all learn from them constructively. It's worth noting in advance that how you perceive the traditional peer review model is an important factor in these discussions, but too complex to address in this post alone. This post is also probably not comprehensive, although I've tried to present a decent overview, and definitely not 100% 'correct'. If anything is missing, please do comment below, especially where I am wrong about something.

What we have to remember though 'in advance' is the main reason why preprints exist: **They are intended to get the results of research acknowledged and make them rapidly available to others in preliminary form to stimulate discussion and suggestions for revision before/during peer review and publication**.

- **Issue: We shouldn't cite work that hasn't been peer reviewed**

Citing work that hasn't been peer reviewed has been traditionally seen as a big academic no no, and is definitely the primary problem that gets continuously raised. However, we need to remember that many journals have been more than happy historically to accept 'personal communication', conference abstracts, various other 'grey literature', and as someone alluded to on Twitter, personal phone calls, as citations, so why should preprints be treated any differently?

If we look at academic re-use statistics, 4 out of the top 5 most cited physics and maths journals are subsections from the arXiv (thanks, Brian Nosek, for this). In Economics, the top cited journal is the NBER Working Papers preprint archive, both according to data from Google Scholar. What this tells us is that research disciplines that have a well-embedded preprint culture see a massive research value in them, even transcending traditional journals in many cases, and does not seem to be causing any major issues in these fields.



The differences in preprint 'standing' between disciplines (source) (AOP = Advanced Online Publication).

A really key point is that citing work without reading it is a form of bad academic practice: responsibility of the citation lies with the citer. Reading a paper as a researcher without evaluating it is also bad academic practice. Evaluating papers is basically a form of peer review, therefore a citation is a sign that we have critically reviewed a paper and decided its value; or at least it should be. After all, evaluating the quality of scientific work is the job of scientists, and should not simply stop because something has a preprint stamp. As Casey Greene said, citations do not "absolve one of the ability to think critically." We should have enough confidence in ourselves to be able to make these judgement calls, but perhaps just be slightly more wary when it comes to preprints. This is particularly the case for research which we heavily draw upon. It is our collective responsibility to carefully evaluate whether a citation supports a particular point – if we cannot do that, we do not deserve the title of scholar. Now this doesn't alleviate all potential biases, but then we can't claim that traditional

closed peer review does either in this case if this is our argument, as it is always the same peers doing the review, or at least to random to draw a line between them.

If a preprint was so bad that it was not able to be cited, then we don't have to cite it. Furthermore, anyone evaluating a preprint who comes to that conclusion and does not leave a comment on the preprint as to how they reached that conclusion is doing the scholarly community, and the public in general, a disservice. The vast majority of preprint services offer comment sections for evaluation, which alleviates a great deal of the issues regarding 'bad science' being published. Of course, not everyone uses these functions yet, but we can expect that they will as preprint adoption and open peer evaluation increases.

The inverse is also true in this case, that just because a paper has gone through traditional peer review, does not necessarily mean it has higher standards and is 100% true. If we believe that published papers are immune from the same problems as preprints, we undermine our own ability to conduct research properly.

- **Issue: Non-specialists might read papers that have 'unverified' information in and then mis-use it.**

Now, this is an interesting and valid concern, and one which is discussed briefly here in the ASAPbio FAQ.

What we also have to remember is that some disciplines have huge preprint sharing cultures, including Physics/Maths (1.2 million, arXiv), Economics (804,000, RePEC), and Applied Social Sciences (732,000, SSRN), and so far they seem to have managed the outflow of information very well. Some existing mitigation methods exist already, such as a simple screening process to block pseudoscience and the spread of misinformation.

In fledgling fields where preprint use is accelerating, such as the Life Sciences, as far as I am aware this has not led to any notable difference in the proliferation of 'fake news' or bad science. Of course, this doesn't mean it couldn't happen, just that it hasn't yet. Ignoring the history of other fields is generally bad-practice and just leads to less-informed discussions about these potential issues. We should make sure to use the positive experiences from Physics, Social Sciences, and Economics and make sure that the ways they combat misinformation are also in place on any new preprint servers for other fields.

Even still, this is a problem not just for preprints, but the entire scholarly literature – research is out there, and people will use it in different ways, and often incorrectly. Think autism and vaccines, for example. This happens whether research or any other content is 'peer reviewed' or not. We should see this more as an opportunity to engage people with the research process and scholarly communication, rather than belittling people for being non-specialists. Bad actors are going to be bad actors no matter what we tell them or what is published or peer reviewed – the last 12 months of 'fake news' and 'alternative facts', as well as decades of 'climate change denial' and 'anti-evolutionists', are testament to that.

In terms of science communication and journalism/reporting, these would benefit greatly from having standards whereby they wait until final versions have been published, just in case. Indeed, most journalists are savvy and respectable enough to recognise these differences. If you want to report on preprints as a communicator, pay attention to any discussion (perhaps via the Altmetric service to track online conversations), and make it clear that you are explicit that the research is preliminary. Journalists frequently do this already when reporting on things like conference talks and proceedings, and the standard should not be any different for preprints.

- **Issue: Citing preprints under-values formal peer review.**

While there are always exceptions, peer review generally benefits both authors and articles. By citing a preprint, you are not de-valuing this process. You are simply using your own judgement, while an article is undergoing formal peer review, to decide whether or not to cite an article and the context of that citation. They are not in conflict, they are complimentary.

- **Issue: Citing preprints lowers the standards of scholarship.**

A big issue here is that often preprints can change compared to their final published form. For example, there might be changes in taxonomy, additional experiments required to be ran, new analyses to add, all of which *can* change the discussions and conclusions.

These are all important things to consider, and will vary depending on research community practices. However, one thing which will greatly ease this is simply to have a big 'Not Peer Reviewed' stamp on preprints, as most do, which should act as a sort of nudge to be more cautious. No one should rampantly re-use published research in any form without adequate consideration and evaluation anyway (see above), but having this stamp makes it easier to slow things down if needed and know when extra care and evaluation is needed. Something that would also make this much easier for us all is to allow data to be shared alongside preprints, as well as code and other materials, so that results can be rapidly verified, or not, by the research community.

We should also take note that science changes through time, and conclusions alter as new evidence is gathered. The very nature of how we conduct research means that previously published information can be, and often is, over-turned by new results, which is not very different from information changing through article versions. The major difference here though is that preprint version control happens in the open, which is invariably advantageous to all parties.

One of Matt's points was that while preprints themselves were fine, it was just their citation that was bad practice. This creates a logical conflict (to me at least), as if the information contained within was fine, then why not cite it appropriately where it is re-used? If it were of such bad quality for re-use, don't cite it, and indicate why. As Ethan White said recently,

"There are good preprints and bad preprints, good reports and bad reports, good data and bad data, good software and bad software, and good papers and bad papers." As before, it is up to the research community and their professional judgments to decide whether or not to cite any research object.

A rule of thumb, for now, that might help with this is if an author, and the reviewers of their article, think it is appropriate for them to cite a preprint then they should be allowed to do so as they would any other article.

- **Issue: Preprint availability creates conflicting articles**

Preprints can change. Preprints published on the arXiv, biorXiv, with the Center for Open Science all have version control that allow preprints to either be updated with new versions or linked through to final published versions. These are usually clearly labelled and can even be cited as separate versions. Using DOIs combined with revision dates makes this a lot easier, as well as simple author/title matching algorithms. Furthermore, preprints are largely on Google Scholar now too, and thankfully this is smart enough to merge records where matches (or 'conflicts') are found.

Instead, what we should be recognising instead of this simple technical non-issue, is the immense value having early versions of articles out can be (in the vast majority of cases). Especially, for example, to younger researchers, who want to escape the often unbearably long publication times of journals and demonstrate their research to potential employers. Or in fast moving and highly competitive research fields, where establishing discovery priority can be extremely important.

- **Issue: What happens to preprints that never get published**

Well, papers never get published for a multitude of reasons. Also, a lot of bad science gets published, and there is no definitive boundary between 'unpublished and wrong' and 'published and correct', as we might like to think. Instead, it's more of a huge continuum that varies massively between publishing cultures and disciplines.

If a preprint never gets published, it can still be useful in getting information out there and retaining the priority of an idea. However, if you find an article that has been published as a preprint for a long time but never formally published, this might be an indicator to be extra careful. Here, checking article re-use and commentary is essential prior to any personal re-use. As before, a simple exercise of judgment solves a lot, for yourself and for non-specialists.

However, as Lenny Teytelman pointed out, in the last 20 years nearly 100% of articles published in the arXiv section on Higher Energy Physics are also published in HEP journals, which *suggests* that this might be a relatively minor issue, at least in this field (i.e., most preprints are ultimately published).

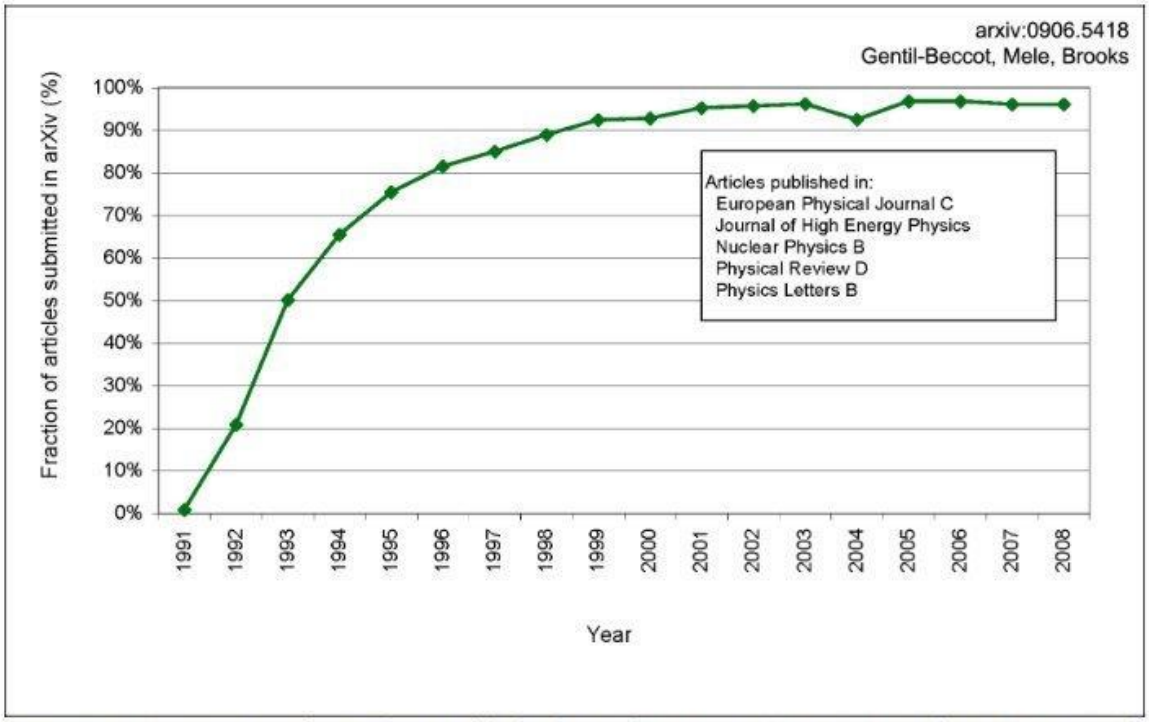


Figure 1. Fraction of articles published in the main peer-reviewed HEP journals which also appeared, in some version, on arXiv.org as a function of time.

Source.

A somewhat relevant tangent

One thing which keeps popping up on Twitter discussions like the ones that inspired this post, and I have to call out here, is the constant "*Well my experience is x, y, and z, and therefore there is not an issue..*" in one form or another, and in particular from those in a position of massive privilege. I'm getting sick and tired of this bullshit lack of empathy and use of 'anecdata' as if it was anything meaningful. It's counter-productive, non-scientific, and completely undermines people who have different experiences or come from completely disparate walks of life. Twitter also makes these exchanges intolerably toneless, and often seem unnecessarily aggressive. Let's keep things civil, professional, constructive, and where possible informed by real evidence and data – you know, like peer review should be. Sometimes, people also don't need to know your opinion, and that's totally okay.

Wrapping it up

At the end of this all, we have to remember that no system is perfect, especially in scholarly publishing. What we should all be doing is making evidence-informed evaluations of processes in order to decide what is best for all members of our community. Especially those who are under-represented or marginalised. We have to listen to a diversity of voices and experiences, and use these to make sure that the processes and tools we advocate for are grounded in the principles of fairness and equity, not reinforcement of privilege or the status quo. This means we have to look at the costs versus benefits, and where we don't have data,

make decisions to either gather those data, or proceed in a way where risk is minimalised and potential gain is maximised.

In terms of solutions to all of this, I think there are several simple points to finish off:

- If you're going to cite a preprint, make it clear that it's a preprint in the reference list, and in the main text if possible.
- If you're going to publish a preprint, make it clear that it's a preprint (most servers already do this).
- Preprint servers need version control. The vast majority do already.
- Community commenting on preprints is essential, especially to combat potential mis-information.
- Preprints compliment, not undermine, the existence of traditional peer review and journals.
- Preprints are gaining increasing high-level support globally. Just like with Open Access and Open Data, this stuff is happening, so best to engage with it constructively in a manner that benefits your community.
- **Exercise judgement when it comes to publishing, citing, and re-using preprints.**
- If preprint citation is happening anyway, rather than fighting against it, let's spend our collective effort on working to support and improve the process. Find what works in other fields, and apply that to ourselves.

Ultimately though, the answer is **YES**.

*Kudos to Matt, who engaged with these discussions with civility despite a clash of opinions. Matt is a colleague, whose inter-disciplinary research includes palaeontology, and he was very helpful as an Editor at PLOS ONE for me recently in helping to support my requests to open up my review report, which I greatly appreciate.

Some further reading:

- On the origin of non-equivalent states: How we can talk about preprints
- Thoughts on preprint citation policy
- Is it OK to cite preprints? Yes, yes it is.
- ASAPbio Preprint FAQ
- The selfish scientist's guide to preprint posting

- Citing preprints in reference lists

Peer review does not have a 'gold standard', but does it need one?

"*However ill-defined it may be, the peer-review process is still the gold standard that will continue to drive scholarly publication*." (source)

I'm not really sure what this means. It sounds like, 'no-one knows what peer review really is, but we'll maintain it at the core of research anyway'...

The same for...

"*While it is not a perfect process, traditional peer review remains the gold standard for evaluating and selecting quality scientific publications*." (source)

We keep repeating this mantra in academia as a sort of shoulder shrug. My feeling on the matter is this:

"*How can something exclusive, secretive, and irreproducible be considered to be objective? How can something exclusive, secretive, and irreproducible be considered as a 'gold standard' of any sort*?" (source)

Because of this, we have absolutely no idea what goes into the hyperdiverse process of peer review. We know that when something comes out, it is conferred the status and stamp of 'peer reviewed'. For some bizarrely unscientific reason, we then maintain this as a pseudo-standard for validity and quality. Except we don't actually have any knowledge of the process that led to this, because that's how peer review largely works. Academic logic at its finest.

Peer review fails peer review, and its own test of integrity and validation, and is one of the greatest ironies of the academic world.

What we should be thinking about instead is how to inject some science into our primary method of 'scientific validation'. Like any human endeavour, it will always be at least partially subjective, but that doesn't mean we can try to eliminate many of the well-documented problems it has (see 'Problems with peer review' here).

Does peer review need a standard?

I wrote about how peer review in general seems to be lacking any form of standardisation recently, due to its inherent traits of being exclusive, secretive, and irreproducible. We as the scientific community should be thinking more about the management, functionality, and

process of peer review. It is our collective responsibility that peer review is held to the same high standards of integrity that we do for research.

Until we can do this, I don't think we should keep pretending that peer review is any sort of 'gold standard', because we just don't have any evidence to support this. However, what we don't want to create is *another* standard, if some already exist, as that would just be redundant.

Some things that exist already

- Code of Conduct and best practice guidelines for journal editors (link)
- COPE ethical guidelines for peer reviewers (link)
- Peer Reviewers Openness Initiative (link)
- A guide to peer review, British Ecological Society (link)
- Referee guidelines, Institute of Physics (link)

The COPE guidelines probably come closest to what we have as a standard: "*The COPE Ethical Guidelines for Peer Reviewers set out the basic principles and standards to which all peer reviewers should adhere during the peer review process*."

To me, these are mostly sets of principles or guidelines to 'do a good job'. They don't quite meet the idea of a 'standard', as they don't define a level of technical quality or attainment that can be used for comparative purposes. Which is useful, say, for examining the utility and functionality of peer review. Guidelines also appear to be a bit too general and open to interpretation at times. The power of a standard comes in its specificity, which doesn't really work too well for a process as diverse as peer review.

I think the COPE guidelines are great, but that we could use them as the basis for something more. For example, having each item in the guidelines as a checklist for referees. Here, each peer review would have to satisfy a certain 'quality' threshold before it is accepted. This would, in my eyes, make it more of a 'technical standard' (i.e., an operational checklist). Ultimately, this would also progress it towards conforming to an 'open standard'.

The main issue that arises is that an actual standard might stifle diversity and creativity in peer review. This is certainly not a good thing.

Yes, what we need is MORE bureaucracy...

Academics hate rules. A standard or set of guidelines creates a rigid system that research suffers far too much from already. The idea of implementing a standard for something as

inherently diverse as peer review has potential desirable outcomes, such as increasing overall quality. But this might come at the cost of becoming too narrow or rigid a process. What we need is for peer review to remain flexible for different communities, but to still perform the basic tasks we hold it to.

Really, the issue lies with pretending that peer review has any sort of standard as a process at all. The quality of peer review is impossible to assess, and therefore we can rarely see whether it has attained a certain threshold or not. It is impossible to quantify, again due to it being a hidden process, which means that we cannot use it for comparative purposes.

So, when people say 'gold standard' of peer review, I don't really know what that means. It's more like holding on to the concept of it as this magical process of validation and gatekeeping, when really we have very little idea if it actually does these effectively. In fact, much of the evidence suggests that peer review fails to even meet the most basic ideals that we hold it to. So practically, I think we need to explicitly stop calling peer review a 'gold standard' of any sort. But does this mean it needs to become 'standardised'?

An alternative solution

All of these guidelines and principles represent more bureaucracy in an already bloated bureaucratic academia. Instead, we could and should be teaching students the reasons why peer review is important. Get this right, and you won't need external guidelines, as they'll be embedded as a culture anyway.

What's better: Having to go through a checklist for each peer review, or knowing in advance how to perform a high-quality peer review?

So instead of guidelines or standards, what we need is better training in the *why* of peer review. Imagine this as a couple of very simple examples:

- **Why**: High quality research is supposed to be reproducible;
    - Consequence: Referees request code and data etc. be made available during peer review to test results;
- **Why:** Published research is supposed to be valid;
    - Consequence: Referees make sure conclusions are supported by results;
    - Consequence: Referees make sure analyses have been conducted correctly;
- **Why:** Published research is supposed to be high quality;
    - Consequence: Referees make sure research passes basic tests of integrity;

- Consequence: Peer review factors into objective assessments of research quality.

These translations of principles to practices shows how teaching students/researchers *why* can lead to automatically conducting peer review at a higher level. How much better is this than telling students they have to do it as "part of their academic duty".

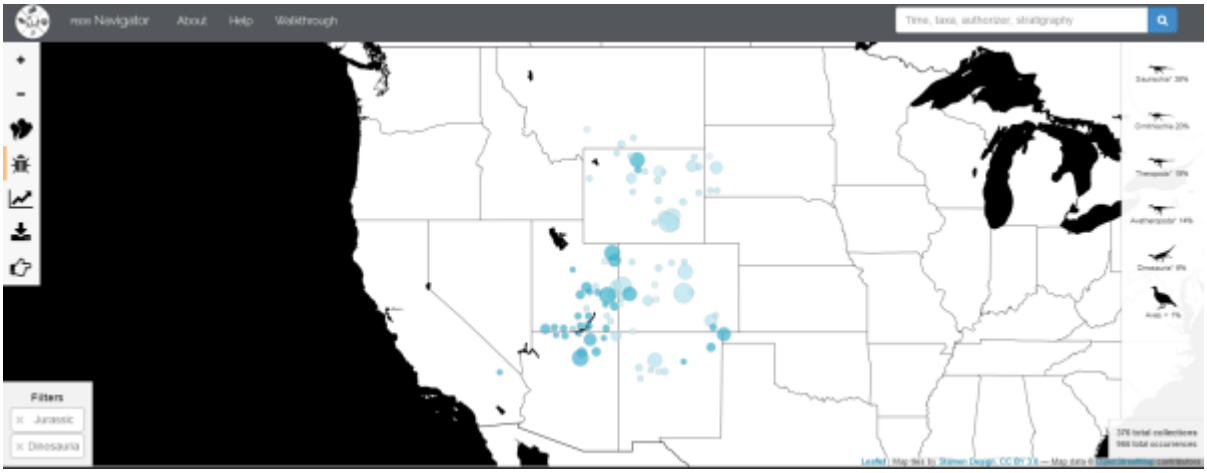
Practical steps

Great initiatives like the Publons Academy are doing much to teach students and researchers the practical steps in doing a peer review. Even I've built a peer review template with Authorea as a sort of 'checklist' for things you should be looking to cover during a peer review. Both of these are more hands-on approaches, but do little to convey why doing rigorous peer review is important.

I think naturally this will see a shift towards open peer review too, something which is already happening, as openness forms one of the cornerstones of reproducible and high quality research. By opening up the process, we can also begin to analyse and quantify it. This forms the basis for creating an actual 'gold standard' for peer review.

How to interact with the whole fossil record.

The Paleobiology Database (PBDB) is a public, digital archive of the fossil record. Based on countless hours of work from more than 400 scientists around the world, it now contains more than 1.3 million individual fossil occurrences from around the world in a single database that is accessible by everyone. That's pretty awesome.



The PBDB in action, with Jurassic dinosaurs from North America!

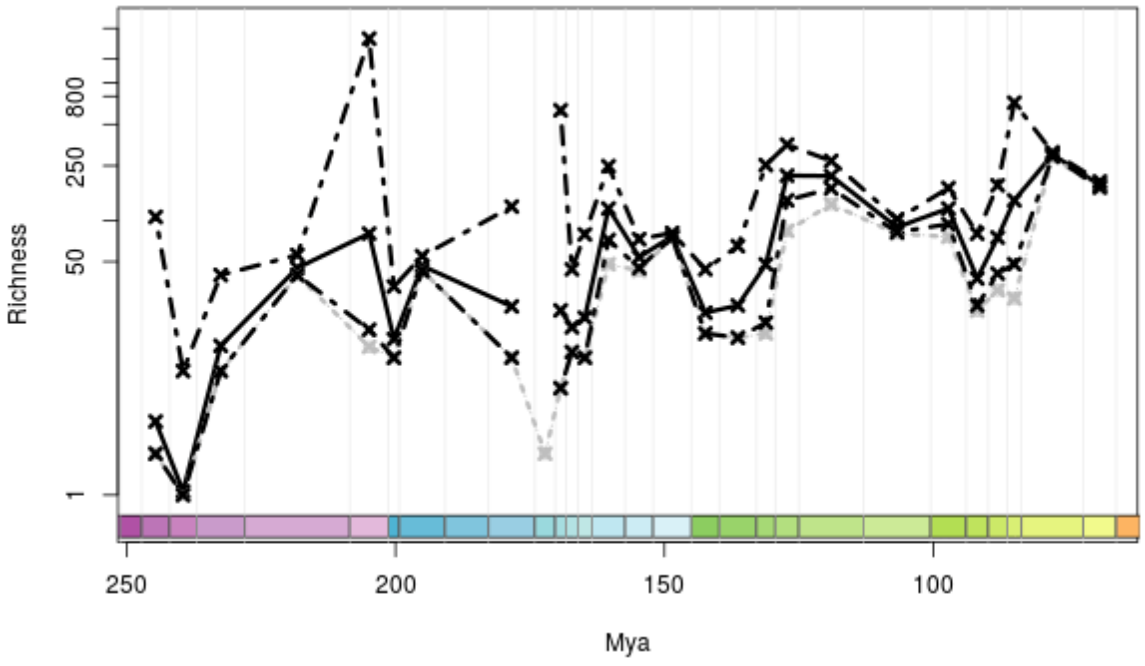
What's even more amazing is what people can do with that. Personally, I've used the PBDB as the basis for several publications, and have contributed much data to it myself during my PhD.

Now witness the power of this fully armed and operational fossil record

Jostein Starrfelt published an intriguing paper last year that unveiled a new method to analyse the fossil record to estimate how biodiversity changes through time. Now, he's leveraged the power of the PBDB to create an interactive tool that allows anyone to visualise how biodiversity changes over millions of years for any fossil group!

For example, you might want to look at dinosaurs again, because dinosaurs. Here's how you do it:

1. Enter 'Dinosauria', the official group name for dinosaurs, in the 'cladename' box
2. Select something like 100,000 occurrences – this is far more than actual dinosaur fossils, but makes sure that the program pulls in all without excluding any by mistake.
3. Click 'Get data and analyse'
4. Wait a few seconds, and the results pop up!



Dinosaur biodiversity through time!

What do these wiggly lines all mean?

How neat is that? What you get are two graphs as outputs. These show you several things that are kinda cool.

1. The grey line shows you the raw diversity estimates calculated by simply adding up the number of different dinosaur species in different time intervals (e.g., geological stages)

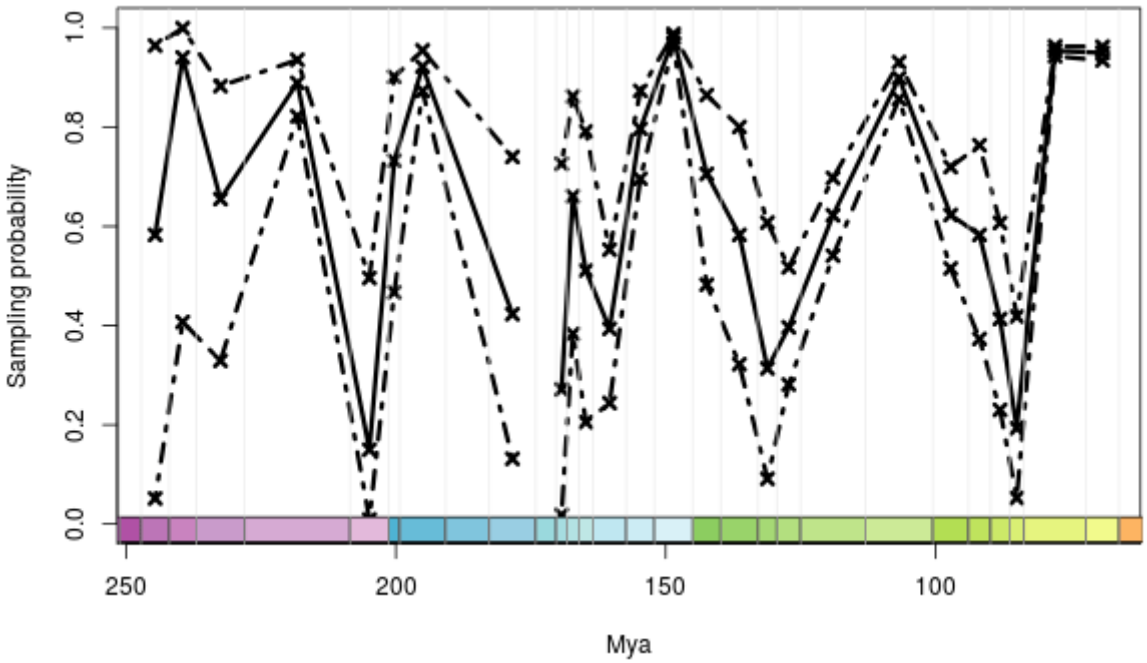
2. The thick black line is the 'corrected' diversity estimate based on Starrfelt's method, called TRiPS. This accounts for differences in the sampling of the fossil record through time.

3. The dashed lines are the upper and lower confidence intervals for the TRiPS diversity estimates. Doing this is just good stats, and accounts for uncertainties in our calculations.

What this tells us, then is how dinosaur biodiversity has changed over millions of years. This is something I've published on before too, and have another paper being currently peer reviewed on, so is of great research interest! As we can see, it has not always been constant. It goes up in some periods, as more dinosaur species are around, and down in other periods as some dinosaur species go extinct.

You too can do a science

Now it's your turn! You can, and should, play with it on your own – try comparing the three main dinosaur groups, Sauropodomorpha, Ornithischia, and Theropoda. Do they all match this larger dinosaur-wide pattern, or have their own evolutionary trajectories? You can work it out for yourself in seconds!



Sampling probabilities through time

The second chart shows how the sampling probability for dinosaur changes through time. This calculation accounts for variation in the number of times each species is observed in the fossil record. That's where things get a bit technical, but is a point of major debate among palaeontologists at the present. Other neat things you can see include the full table of results, an 'occurrence matrix' (very handy for advanced analyses), as well as who entered the data (you'll even be able to see me if you do anything with Jurassic or Cretaceous animals!). In short, this is awesome. Really awesome. And a huge 'open science' step for Palaeontology. I also totally wanted to build this, and am glad to be able to spend the time doing other things now.

One of the cool things is, because Starrfelt has only published his method on dinosaurs (for now), almost every time you analyse data for any other group, that will be the first time that research has ever been made, and the resulting patterns displayed. Go forth and science!

Trust me, I'm a scientist.

Why should people trust the published scientific record?

Why?

Imagine this hypothetical, but potentially very real, conversation with a non-academic:

1: “This research paper has been published, and therefore is scientifically valid.”

2: “But it’s paywalled, I can’t access it. How do I know it’s valid?”

1: “Because it has been peer reviewed.”

2. “Can you show me the peer reviews?”

1: “No. But it was done by two experts in the field.”

2: “Which experts?”

1: “We don’t know. But it’s in a top journal.”

2: “Why is it a top journal?”

1: “Because it has a high impact factor, so is highly cited.”

2: “Why does that make the research better?”

1: “Trust me. I’m a scientist.”

Imagine this is on a topic like climate change, and you can see why this might be an issue. You can play through the same conversation with almost any aspect of scholarly publishing.

1: “This research is based on rigorous data.”

2: “Can you show me the data and how it was collected?”

1: “Well, no. The researchers have not shared it.”

2: “So how do I know the results are valid?”

1: “Because the process is described in the methods.”

2: “But I can’t find the code or software they used to create those results. How do I know it’s valid?”

1: “Trust me. I’m a scientist.”

Trust needs transparency

We have a scholarly communication that is essentially built on trust, but beset on all sides by secrecy, opacity, and barriers like paywalls. The problem here is that it is easy to see how this can lead to an ‘anti-scientific’ sceptical mindset. We ask people to believe what is published, when we have no real way of verifying the process. This goes beyond Open Access too – that just enables people to read research, not to see how or why it should be considered to be verified.

Peer review, data, rigorous analysis – these are the things that are supposed to set science apart from other forms of publishing and knowledge creation. Except overwhelmingly these processes are secretive, and hidden away from us. We really have no idea what happens before a research paper gets published, yet we are simply expected to accept that it is more valid or more verified than any other source.

You can even go a step further. Being ‘pro-science’, as in believing that published research is verified research, requires you to trust the system. You have to take a leap of faith, and that is quite unscientific.

What can we do?

Well, that’s simple:

1. Publish your peer review reports. All of them. Anonymously if needed.

2. Publish your data. Raw and treated. If not, make sure you have a damn good reason not to.

3. Publish methodologies and protocols more clearly, in a stepwise manner if possible. Justify each step.

4. Publish all of your software and code, or at least make sure they are publicly accessible.

5. Publish your work Open Access, of course. (Before you respond with $$ related issues, read this.)

6. Publish your work as a pre-print if possible. Let people see the beginning, the transformation, and the end.

These are just a few of the larger steps, but there is a whole world out there of things you can do. Transparency breeds trust. Opacity breeds scepticism. Science needs the former, badly.

Why does all of this matter?

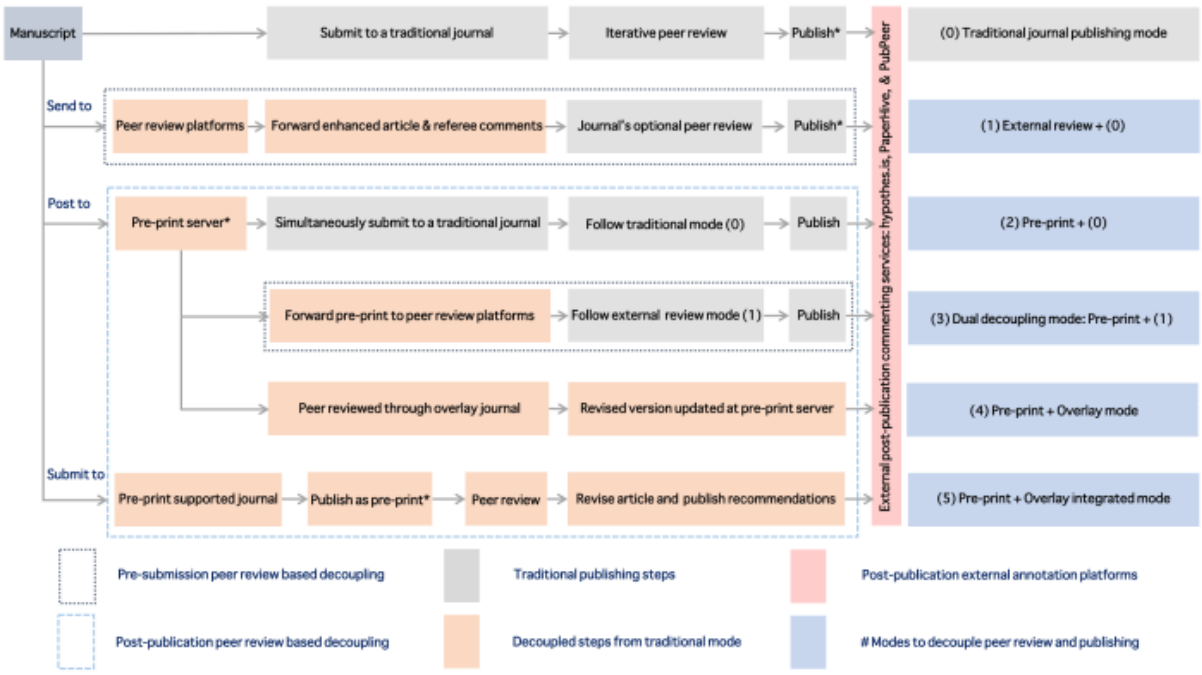
We are in a global information and knowledge-literacy crisis. That much is undeniable. What the scientific community need to do is come together and work harder to engender public trust in science again. There is simply too much at stake not to commit to this.

Innovations in peer review.

Peer review is broken, but we hold the technological and social solutions to fix it. Right now.

We just submitted a monster paper on the history and present diversity of peer review practices to F1000 Research. It's available in advance here, and soon will be open to public commenting from anyone as it undergoes formal peer review. We wrote it in a similar manner to another paper published on Open Access last year.

I don't want to beat around the bush here. We have 33(4) top of the range authors from across a huge range of disciplines. We spent more than a year whacking and moulding this into shape, bringing in an enormous amount of research and expertise. It started as an idea during a Mozilla Sprint in Berlin with myself and Jonathan Dugan in 2016, and evolved into this huge analysis of the history of peer review, the issues with the process versus the ideal, and an in-depth examination of how it could function based on modern Web technologies.



The present diversity of different publishing models.

It's worth the read. I promise.

It's also 44 pages long. Now, I realise this can be off-putting, so I have a request. Please, bear with it. Peer review is such an important process, that we cannot be ignorant of it any more. This paper does not hold all the answers, and it is certainly not perfect. But what we have created is an enormous resource of research and thought, and from a huge diversity of perspectives. Grab a coffee, and have a read! It was made for everyone out there, and is an opportunity for you all to learn, and to give us your feedback on what you think.

Something unexpected which came out of this can be found in Section 4. We speculated about what an 'ideal' hybridised peer review platform would look like if we brought all the different aspects we had discussed together, in order to create an optimal system fit for a modern research environment. It's actually not a bad idea at all, and could potentially overhaul our entire scholarly communication system, if we were to build and implement it at a large scale.

Throughout the entire manuscript, we have attempted to be balanced and evidence-informed. If this is not the case anywhere, please, let me know. I want this to be the best available resource for learning about peer review that exists.

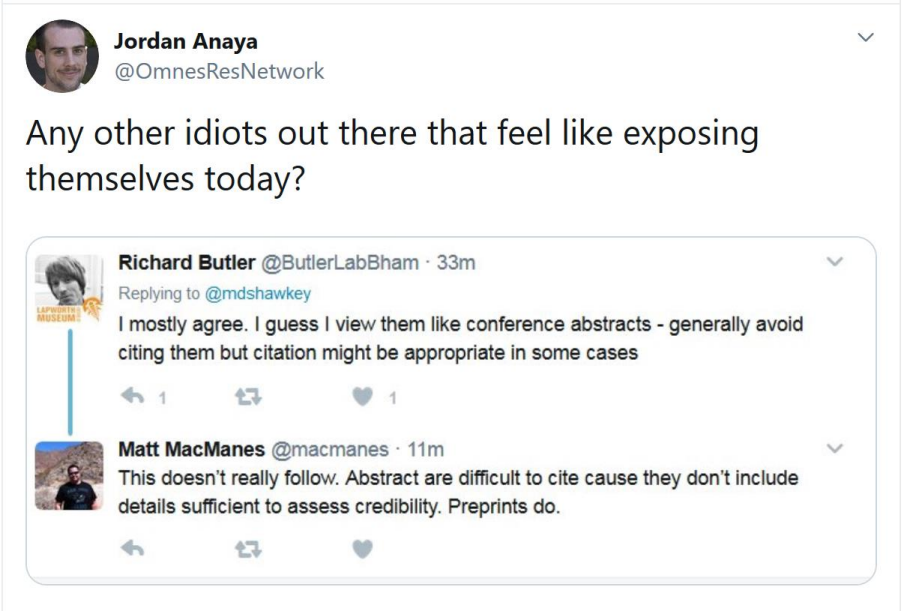
Abstract

Peer review of research articles is a core part of our scholarly communication system. In spite of its clear importance, the status and purpose of peer review is often contested. What is its role in our modern, digital research and communications infrastructure? Does it perform to the high standards with which it is generally regarded? In addition, the historical evolution

and present diversity of peer review is not appreciated by the research community. Differing peer review processes developed over several hundred years in a response to the needs of journals, scholarly societies, and research communities. Today, it is viewed as an inherent and altruistic responsibility among researchers, but also a common point of contention with commercial publishers. Studies of peer review have shown that it is prone to bias and abuse in numerous dimensions, frequently unreliable, and can fail to detect even fraudulent research. With the advent of Web technologies, we are now witnessing a phase of innovation and experimentation in our approaches to peer review, with new concepts and models emerging at the same times as the broader development of open research. These developments prompted us to examine emerging models of peer review from a range of disciplines and venues, and to ask how they might address some of the issues with our current systems of peer review. We examine the functionality of a range of social Web platforms, and compare these with the traits underlying a viable peer review system: quality control, quantified performance metrics as engagement incentives, and certification and reputation. Ideally any new systems will demonstrate that they out-perform current models while avoiding as many of the biases of existing systems as possible. We conclude that there is considerable scope for new peer review initiatives to be developed, each with their own potential issues and advantages. We also propose a novel hybrid platform model that, at least partially, resolves many of the technical and social issues associated with peer review, and can potentially disrupt the entire scholarly communication system. Success for any such development relies on reaching a critical threshold of research community engagement with both the process and the platform, and therefore cannot be achieved without a significant change of incentives in research environments. A major part of this relies on research communities recognizing that peer review is not a static or singular process, but a constantly evolving, and ideally improving, mechanism of quality assurance. This could greatly reduce friction to the cultural adoption of new models, and lead to a peer review process fit for a modern scholarly communication system.

Open Science has an image and behaviour problem.

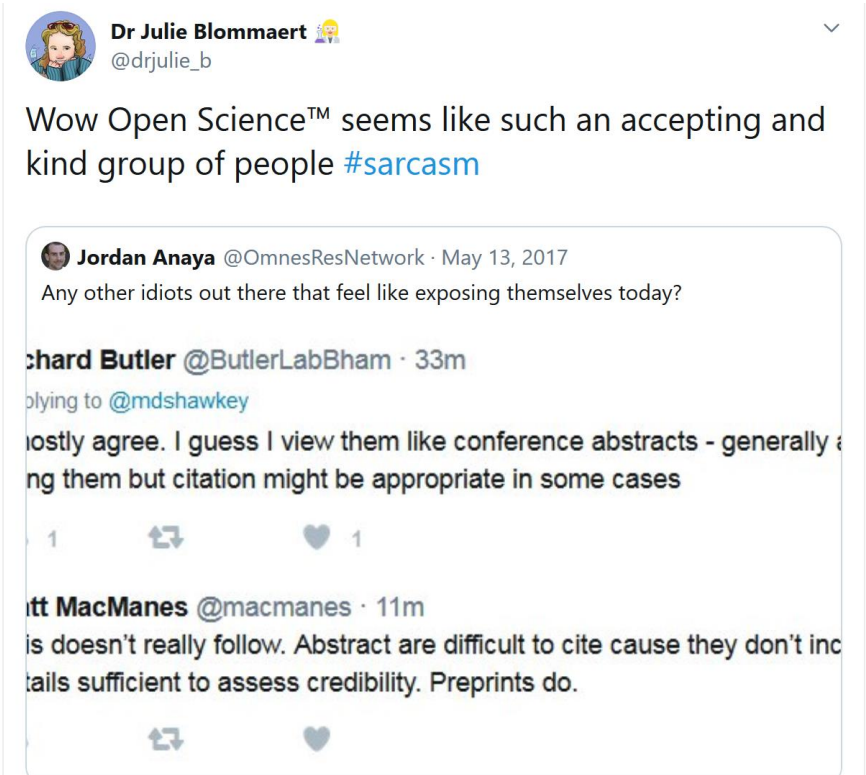
This is not the first time this sort of thing has happened on Twitter. A direct series of insults towards researchers for expressing their view on a matter relating to ‘Open Science’.



Source.

Yeah, that's not helping.

This was a response to a debate about whether or not we should cite preprints from around a month ago, but sparked a new wave of discussion recently.



Source.

While it is perhaps easy to understand the frustration of some when encountering the same sort of resistance over and over, and going through the same debates, this in no way justifies a lack of civility in our public discourse about the matter.

"*Open science is supposed to be about improving science and science culture, but it often feels like many of its advocates are actually making a lot of the public discourse much more unpleasant, and that very actively damages their own cause*."

– *Anonymous*, based on this conversation.

Yes, this is a problem. And no, it's not trivial.

This is an enormous problem for the 'Open Science movement' as a whole. One of the core principles of 'Open', to me, is inclusivity. So much so, that I just made it one of the key points of Module 1 in the Open Science MOOC. This sort of behaviour does not foster a culture of inclusiveness; it does the exact opposite. Aggressive behaviour, whether intentional or not, makes people feel they can't have public discussions about these things without fear of getting shouted down or insulted by people in the 'in group'. This ultimately drives away engagement, stifles diversity, and slows down progress.

It doesn't matter if it's just a few people too – a few bad apples spoil the bunch, and all that. What matters is that it happens, is part of a collective image, and is distinctly exclusive behaviour. I think at least a small part of this has to do with the labelling of people in the 'in group' as 'Open Science Advocates'. It doesn't do well to homogenise a diverse group of people with a single label or identity, in this case. I feel this sort of legitimises bad behaviour of those on the inside, as they can excuse it, particularly when much of that 'advocacy' is driven by passion and principles. It also polarises people into being 'open' and 'non-open', which are definitive ends of a huge multi-dimensional spectrum in science. The consequence is creation of a divide, and ultimately these sorts of conflicts.

Responsibility lies with us all

What we have to remember is that Open Science is a social movement. This means that we have to be sure that all communities and demographics feel welcomed and invited to participate in discussions, and not excluded from them. It can be easy to let our emotions and frustrations and interfere with this, that much is understandable. But we can be better and stronger as a community by actively preventing this. I'm not innocent either, and have in the past said some things I regret to others on social media. What matters, though, is using those experiences to become better for ourselves and others.

When we see bad behaviour, from and towards anyone, it is each of our responsibilities to call it out. Preferably via a civil note in private, rather than any sort of public shaming. If we

see this sort of behaviour happening and don't try and stop it, then we're complicit in allowing it to happen. This is especially the case when it is happening within our own communities or social circles. Don't turn a blind eye, as that never solves anything.

And it doesn't matter that this sort of behaviour is actually fairly widespread on social media. What matters is being better than that. Taking the moral high ground, engaging with those who you don't agree with in a courteous manner, listening instead of insulting. These are all things that we should be practising on social media, because that's just doing this stuff right. At the end of the day, we want a social environment where people feel welcomed to share their views without fear of retaliation.

The dark side of peer review, Eon Magazine.

To identify or not to identify? The rift widens.

Debates surrounding anonymous versus eponymous peer review are some of the most polarised in scholarly communication. Speak to one researcher, and they will tell you stories of the wonderful collaborations they gained after signing a review. Speak to another, and you will elicit outrage as they tell a much darker tale of targeted abuse they suffered for the same practice. Different levels of bi-directional transparency during peer review mean very diverse things to different demographics, and consequentially have led to much resistance to the idea and implementation of any system of 'open peer review'. Challenges surrounding reviewer transparency are invariably social, rather than the technical. This is because transparency is strongly coupled to behaviour, and also to the perception of how behaviours will change based on reciprocal identification.

Proponents of traditional double-blind peer review claim that it was designed to protect reviewers and authors, so that evaluation remains impartial and focussed on the research, rather than being *ad hominem*. Here, the lack of transparency is supposed to protect reviewers from potential backlashes for fully expressing themselves, and increase the honesty of their assessments. However, it is rarely that simple in reality, and reciprocal anonymity can be difficult to protect. There are ways in which identities can be revealed, either with or without malicious intent. Those who favour anonymity claim that identification leads to less-critical and skewed reviews, it is biased by community selectivity, and leads to reviewers being even stricter within an already conservative environment, thus imposing further potential prevention on the publication of research.

Opponents of double-blind peer review claim that anonymity can lead to reviewers being more aggressive, biased, and politicised in their language than they otherwise would be. This is because there are no negative repercussions for their actions, and therefore anonymity is seen to be protective in a different manner. Proponents of identification therefore claim it

has the potential to encourage increased civility, accountability, and more thoughtful reviews, as well as extending the process to become more of an ongoing, community-driven dialogue rather than a singular event with a definitive finality. Furthermore, by protecting the identity of reviewers, an aspect of the prestige, quality, and validation associated with the review process is lost, leaving researchers to speculate on this post-publication. Transparency gained from signing peer reviews can resolve competition and conflicts that can potentially arise due to the fact that referees are often the closest competitors to the authors, as they will naturally tend to be the most competent to assess the research.

Despite being widely used, a single-blind process as the 'middle ground' imposes a skew in accountability upon the reviewers, while authors remain relatively protected from any potential prejudices against them. Justification for this process is the validation that transparency provides, in that any corruption should be mitigated due to the additional exposure that transparency provides. This brief summary of the arguments for and against transparency in peer review highlights its often over-lapping, and sometimes conflicting, nature, and it remains inherently unclear whether transparency is objectively good or bad.

What does the research say?

Research has shown that the philosophical debates surrounding identification are strongly reflected in the attitudes of researchers. Some studies have highlighted an overwhelming preference towards blinding from reviewers from some research communities (Baggs et al. 2008; Melero & Lopez-Santovena 2001). Others have found that where the majority of reviewers signed their reviews or were more willing to do so, they also became of higher quality and more courteous, although also took longer to complete (Snell & Spencer 2005; Walsh et al. 2000). Randomised trials have found that blinding improves the quality of reviews, and that authors become less upset by hostile comments if they are aware of the identity of reviewers (McNutt et al. 1990). Other randomised trials at a larger scale found almost the exact opposite, and that blinding reviewers has no bearing on the overall quality of reviews (Justice et al. 1998; Van Rooyen et al. 1999), or even some times having a negative impact on quality (Jadad et al. 1996). The majority of additional evidence suggests that anonymity has little impact on the quality or speed of the review or of acceptance rates (Isenberg et al. 2009; van Rooyen et al. 1998), but revealing the identity of reviewers may lower the likelihood that someone will accept an invitation to review (Van Rooyen et al. 1999).

This small sample from a range of population-level studies into identification preferences exposes a rather complex picture. They have produced different, and often conflicting, results on the impact of author and reviewer transparency, ultimately creating little overall consensus on the system-wide practice of peer review. What is becoming increasingly clear is that simple calls for 'more transparency' or 'less transparency' end up over-simplifying an inherently complex, multi-dimensional, and often highly nuanced issue. It is, however, inescapable to conclude from the polarisation of the discussions around peer review that it is

anything but objective, rarely impartial, and definitely not as simple as we often regard it to be.

The interplay of transparency and bias

This debate of reviewer identification is not to be taken lightly, and partly the cause of general attitude of conservatism from it by the research community, and it comes up as the most prominent resistance factor in almost every discussion about open peer review. Junior researchers and those in positions of relatively less power, including demographics that are already marginalised or under-represented, in particular are perhaps the most conservative in this area. They may be afraid that by signing overly critical reviews (i.e., those which investigate the research more thoroughly, or are more expressive), they will become targets for retaliatory backlashes from more senior researchers. In this case, the justification for reviewer identification is to protect those demographics from bad behaviour.

There have also been numerous studies that have revealed bias against women in scholarly publishing to varying degrees (Darling 2015; Helmer et al. 2017; Lerback & Hanson 2017; Lloyd 1990; Peters & Ceci 1982; Roberts & Verhoef 2016; Tregenza 2002), indicative of wider-scale issues with the representation of women in research (Ceci & Williams 2011). However, at the present, there is no consistent story as to the extent of such bias, as well as that based on nationality, institute, or language, in a modern research environment (Lee et al. 2013). There is no longer the question of whether peer review is biased, but what these dimensions of bias are, what the causes of them appear to be, and what the solutions we can implement to mitigate them.

Transparency as a mechanism for a better scholarly culture

Through all of this debate, it remains largely unclear how the widely-exclaimed but poorly documented potential abuse of signed-reviews, and harassment of particular demographics, is notably different from what exists in a closed system. At least part of this is probably because such retaliatory behaviour occurs in private. Such is probably the main reason why this abuse has not formally been documented as a direct consequence of reviewer identification. Proponents of identification here will claim that the reason for this is because reviewing with prior knowledge of identification prevents backlashes of any sort as reviewers do not want to tarnish their reputation in public. Indeed, publishers that have long had a process of reviewer identification, such as *BioMed Central* and *Frontiers*, do not seem to be suffering from serial harassers, but rather appear to be thriving. Nonetheless, the attitudes of many researchers towards reviewer identification suggest that there is still a strong social stigma associated with it that needs addressing.

In an ideal peer review system, we would hope that strong, honest, and constructive criticism is well received by researchers. Yet, it seems that there is the very real perception, and often reality, that this is not the case. Whatever form the negative behaviour takes, retaliations to

referees represent serious cases of academic misconduct. We need to be absolutely clear though that this is not a direct consequence of reviewer identification, but rather that transparency facilitates it. However, taking a step back, we should recognise that this is more about a failure of the academic system to recognise the existence of inappropriate behaviour and take action against it, rather than a failure of open peer review.

What we should be mindful of is the fact that bias and negative behaviour already occurs as part of the peer review system, including for double-blind peer review, despite generally being considered as more conservative or protective. This suggests that bias is a more general issue within peer review and academia more broadly, and we should be careful not to attribute it exclusively to any particular mode or trait of peer review. Increased transparency helps to highlight where such incidents happen, and can therefore aid mitigating and tackling the potential issues of misconduct. The Committee on Publication Ethics, COPE, already provides advice to editors on how to handle cases of peer review misconduct. COPE could be extended to provide the basis for developing a formal mechanism for preventing, managing and resolving misconduct that arises from reviewer identification. This highlights the doubled-edged sword that transparency brings, by facilitating increased interaction, some of which might be negative, but then also providing the basis for dealing with any issues. Furthermore, in a closed system, it is much more difficult to prevent or deal with cases of misconduct due to the secrecy involved in the process.

If the main purpose is of transparency as a mechanism is accountability, then we have to firstly recognise that this is almost entirely absent at the present, and secondly that it will not result from the process naturally. Accountability has to be built into the structure of the peer review system, which means that when issues and concerns are raised then they are sufficiently dealt with. This will be an extremely important social factor to consider in any future development of peer review, and one which can ultimately be used to foster a fairer, more inclusive, and equitable system of peer review. Any future system should be flexible, and allow referees to have the choice of identification.

The fact that remains that we cannot have calls for increased transparency in peer review without first providing solutions for the perceived risks associated with it. In the future, by emphasising both the different and common values across research communities, it is likely that we will see a new diversity of processes developed, and different experimentations with reviewer transparency. Remaining ignorant of the existing diversity of practices and inherent biases in peer review, as both social and physical processes, would be an unwise approach for future innovations.

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We have the technology to save peer review – now it is up to our communities to implement it, LSE Impact Blog. Co-written with Daniel Graziotin and Sarah Kearns.

Peer review of scientific research papers forms one of the cornerstones of our knowledge generation process. Since its origins in the 19th century, it has become a diverse and complex process. The purpose of peer review is to evaluate and improve the quality, novelty, validity, and impact of submitted papers and the underlying research. Despite being viewed by many as the gold standard of certification for research, there is now increasing evidence that the ideal of peer review is not equally matched by its process or practice.

Research has shown that peer review is prone to bias in numerous dimensions, frequently unreliable, and can even fail to detect fraudulent research. This is a critical issue at a time when public education and engagement with science, and trust in research, are needed due to the proliferation of "alternative facts", where expertise is often casually dismissed in important socio-political domains. While we believe that the ideal of peer review is still needed, it is its implementation, and the present lack of any viable alternative, that must be looked at for improvement.

In our latest research paper, published at F1000 Research, we brought together an international, cross-disciplinary team of 33 authors to look at the history, present status, and potential future of peer review. As a team, we felt there were some important questions about peer review that needed to be examined in greater detail. For example, what role does it play in our modern digital research and communications infrastructure? Does it perform to the high standards with which it is generally regarded? How can the power and practices of the web, particularly the social aspects of Web 2.0, be leveraged to think about innovative models for peer review?

We showed that there has been an explosion in innovation and experimentation in peer review in the last five years. This has been fuelled by the advent of web technologies, and an

increasing realisation that there is substantial scope to improve the process of peer review. By combining the knowledge and experiences from across a diverse range of disciplines, we took an introspective look at peer review, one we hope will be useful for future discussions on the topic.

We believe that there are three core traits that underpin any viable peer-review system: quality control and moderation, performance and engagement incentives, and certification and reputation. We also strongly believe that any new system of peer review must be able to demonstrate that it not only outperforms the current models, but also that it avoids or eliminates as many of the biases in existing systems as possible.

Quality control and moderation

Quality control is the core function of peer review, and is what distinguishes the scholarly literature from almost any other type. Typically, this has been administered in a closed, venue-coupled system with few actors; namely authors, reviewers, and editors, with the latter managing the process. A strong coupling of peer review to journals plays an important part in this due to the common, albeit deeply flawed, association of researcher prestige with journal brand. The issue here is that "quality" of peer review remains based on trust, rather than anything substantive. While, intuitively, the quality of peer review at more prestigious journals might be considered higher than at smaller journals, we cannot objectively state it is as there is simply not enough evidence due to the opacity of the process.

Other social knowledge-exchange platforms such as Wikipedia, Stack Exchange, and Reddit have self-organised communities and governance structures (e.g. moderators) that represent possible alternative models. Here, moderators have the same operational functionality as journal editors in terms of gate-keeping and facilitating the process of engagement. Individual research communities could transparently elect groups of moderators based on expertise (e.g. automated through ORCID, using the number of previous publications as a threshold), prior engagement with peer review, and assessment of their reputation. Different communities could use specific social norms and procedures to govern content and engagement, and to self-organise into individual but connected platforms.

In such a system, published objects could be preprints, data, software, or any other digital research output. Quality control would be provided by having a system of semi-automated but managed and open peer review, with public interaction, collaboration, and transparent refinement through version control. Community moderation and crowdsourcing would play an important role, preventing underdeveloped feedback that is not constructive and could delay efficient research progress.

When authors and moderators collectively deem the peer-review process to have been sufficient for an object to have reached a *community*-decided level of quality or acceptance,

the review is complete. Some journals, such as the Journal of Open Source Software, already implement this process successfully. While traditional editorial roles are not foreseen in our vision, we recognise there are still potential extreme cases where consensus is not achieved and third-party involvement is required. This can be achieved, for example, through impromptu election of a highly ranked, super-moderator or arbiter, or an F1000-like system of discontinued peer review. Following this process, the objects can be indexed, and the updated version can be assigned a persistent identifier such as a DOI, as well as an appropriate license allowing for maximum reuse (including then sending to a traditional journal) and process sustainability.

The important distinction here from the traditional model is the active promotion of inclusive participation and community interaction, with quality defined and controlled by a process of engagement and digestion of content. If desired, these objects could then form the basis for manuscript submissions to journals, perhaps even fast-tracking them as the quality assessment would already have been completed. The role of peer review would then be coupled with the concept of a "living published unit", and with dissemination and validation of research occurring independent of journals.

Performance and engagement incentives

To motivate and encourage participation with peer review, incentives will increase wider engagement. Lowering the threshold of entry for different research communities starts to make open peer review more accessible and less burdensome. One of the most widely-held reasons for performing peer review is a *quid pro quo* sense of academic altruism or duty to the research community. However, at present this is imbalanced and researchers still receive far too little credit or recognition for their efforts. Directly tying to certification and reputation is the ultimate goal of most academic incentive systems.

New ways of encouraging peer review can be developed by quantifying engagement with the process and linking this to academic profiles. To some extent, this is already performed at platforms like Publons or ScienceOpen where the records of individuals reviewing for a particular journal can be integrated into ORCID. Platforms such as Reddit, Amazon, and Stack Exchange use gamification and represent a model in which participants receive virtual rewards for engaging with review. Those activities are further evaluated and ranked by the community via upvotes and usefulness scores. A hierarchical reward system based on badges could be integrated into this, including features for content or individuals such as "Top 5% reviewer", "Successfully replicated", "500 upvotes", or whatever individual communities decide is best.

The distinction from the traditional process is that highly rated reviews gain more exposure, more scrutiny and recognition, and ultimately more credit. This creates the incentive to

engage with the process in a way that is most beneficial to the community, which can then be used as a way of establishing prestige for individuals and for content.

Certification and reputation

The current peer-review process is generally poorly rewarded as a scholarly activity. Performance metrics provide one way of certifying peer review, and provide the basis for incentivising participation. As outlined above, a fully transparent and interactive process, combined with reviewer identification, makes clear the level of engagement and added value from each participant.

Certification can be provided to contributors based on their engagement with the process: community evaluation of their contributions (e.g. as implemented at Amazon, Reddit, or Stack Exchange), combined with their reputation as authors. Rather than having anonymous or pseudonymous participants, for peer review to work well in this open system requires full identification, to connect on-platform reputation with authorship history. Rather than a journal-based form, certification is granted based on continuing engagement with the research process and is revealed at the object and individual level.

The distinction from the traditional model here is that achievement of certification takes place via an evolving and continuous process of community engagement and can be quantified. Models like Stack Exchange are ideal candidates for such a system, and operate through a simple and transparent up-voting and down-voting scheme, combined with achievement badges. Such quantifiable performance metrics could easily be tied to the academic reputation of individuals. As this is decoupled from journals, it alleviates all of the well-known issues with journal-based ranking systems and is fully transparent. This should be highly appealing not just to researchers, but also to those in charge of hiring, tenure, promotion, grant funding, and research assessment, and therefore could become an important factor in future policy development.

Challenges and future considerations

None of the ideas proposed above is radical, unachievable, or beyond current technical and social means. There are working models that demonstrate the potential feasibility of such a system, as exemplified by a huge range of web-native platforms, many of which scholars already engage with. Instead, what we suggest here is the simple recombination of existing traits from successful social platforms into a single, hypothetical hybrid platform.

A key challenge our proposed hybrid system will have to overcome is simultaneous uptake across the whole scholarly ecosystem. In particular, this proposal involves a requirement for standardised communication between a range of key participants. Real shifts will occur where elements of this system can be taken up by specific communities, but remain interoperable

between them. Identifying sites where stepwise changes in practice are desirable to a community is an important next step. Increasing the – currently almost non-existent – role and recognition of peer review in promotion, hiring and tenure processes could be a critical step forward for incentivising the changes we have discussed. As such, we expect that research funders at a range of levels should be interested in pooling knowledge and resources to build such a platform as a consortium.

By looking at the increasing adoption of social technologies by digital communities, we can see that there is considerable scope and appetite for the significant development and adoption of new peer-review initiatives proposed herein. Such an initiative has the potential to resolve many of the technical and social issues associated with peer review, and also disrupt our entire system of scholarly communication. High-quality implementations of these ideas in systems that communities can choose to adopt may act as de facto standards that help build towards consistent practice and adoption. We look forward to seeing progressive developments in this domain in the near future.

paleorXiv: Post-launch update.

It's been almost 2 months since paleorXiv launched! Since then, 35 papers have been published on the platform. We maintain a database of them all here. We have also created a Code of Conduct and a Diversity Statement, developed with the help of the wider community. These are to help foster paleorXiv as a welcoming community space.

Of these 35 papers, just 8 are actual preprints, and one is the final published version of an Open Access paper. Most, 26, are postprints – the accepted, peer reviewed version of a paper before it undergoes the final transformation. I would like to extend my deepest thanks to all those who have offered their assistance, either by submitting articles, offering feedback and advice, or personal support as this project develops. We could not have got this far without you!

Dean Lomax, Palaeontologist and Visiting Scientist at The University of Manchester, has published many articles now with paleorXiv. He said:

"*PaleorXiv is free and easy to use. It is a great way for others to notice your research, which results in more people reading your work(s). Thus, learning. It might also generate more citations, although only time will tell.*"

Based on the number of downloads, the top publications so far are:

1. Dan Peppe et al – Reconstructing palaeoclimate and paleoecology using fossil leaves (**131**)

2. Rubiyanto Kapid et al – The Indication of Mid Miocene Climatic Optimum (MMCO) from Cibulakan Formation, Bogor Basin, Indonesia (**113**)

3. Dean Lomax and Ben Hyde – Ammonite aptychi from the Lower Jurassic (Toarcian) near Whitby, North Yorkshire, UK (**105**)

4. Robert Boessenecker et al – A toothless dwarf dolphin (Odontoceti: Xenorophidae) points to explosive feeding diversification of modern whales (Neoceti) (**91**)

5. Stephen Pates et al – *Aysheaia prolata* from the Utah Wheeler Formation (Drumian, Cambrian) is a frontal appendage of the radiodontan *Stanleycaris* (**85**)

6. Jérémy Anquetin – Evolution and palaeoecology of early turtles: a review based on recent discoveries in the Middle Jurassic (**85**)

7. Jon Tennant and Alfio Chiarenza – How has our knowledge of dinosaur diversity through geologic time changed through research history? (**85**)

8. Caitlin Syme et al – Depositional environment of the Lower Cretaceous (Upper Albian) Winton Formation at Isisford, Central-West Queensland, Australia, inferred from sandstone concretions (**68**)

9. Gabriel Ferreira et al – New turtle remains from the Late Cretaceous of Monte Alto-SP, Brazil, including cranial osteology, neuroanatomy and phylogenetic position of a new taxon (**66**)

10. Jérémy Anquetin – The anatomy of the basal turtle *Eileanchelys waldmani* from the Middle Jurassic of Isle of Skye, Scotland (**66**)

We'll continue to highlight the top articles every couple of weeks, as well as any exceptional performances from within the community. You can join in by submitting **here** – it takes no time at all!

PaleorXiv has been developed based on continuous engagement with the research community. To make things as simple as possible, we designed a set of field-specific submission guidelines for authors. For example, new taxonomic names must be redacted prior to submission, and it is advised for a cover page to be added noting the publication and peer reviewed status of each manuscript.

PaleorXiv also provides a comprehensive database of journal policies to help researchers understand the options available to them for self-archiving. The database includes information on APCs and embargo periods, and can help inform researchers about the

optimal routes available to them to make their research Open Access. We like to think that paleorXiv is not just a publishing platform, but also a community resource for learning about some of the intricacies involved with scholarly communication.

Key features of paleorXiv:

- It's free.
- It's 'Open Access' under a CC-BY 4.0 license.
- All articles receive DOIs, and can be assigned final version publication DOIs.
- We use version control for easy file updating.
- Quick: Submission takes around 5 minutes, and articles are published instantaneously.

Created with the technical assistance of the open source Center for Open Science, paleorXiv is a community-led platform for research publication. For further reading, please see 'Welcome to paleorXiv', and our launch press release.

Leaving ScienceOpen – Time to say goodbye.

Well, it has finally come to that time. After two years at ScienceOpen, I'm sad, but also excited, to announce that I'll be leaving at the end of the year. Sad because I'll be leaving an amazing team of creators, thinkers, and doers – people who I'm proud to call not just my colleagues, but also my friends. Excited though because this means that new adventures await!

An open journey

I started at ScienceOpen back in January 2016, while still writing up my PhD (I love procrastinating). I had been personally interested in what is generally now termed 'open science' for about 5 years prior, and working with ScienceOpen seemed to fit with my ideals, while learning more about the scholarly communication and publishing industry. You often hear people complaining that researchers don't know enough about the publishing industry or process itself (still true), and I wanted to equip myself with some knowledge to help with this.

Back then (the old days…), ScienceOpen was primarily all about innovative, and disruptive, ways to do Open Access publishing. Since then, the company has evolved to become something entirely different, and it has certainly been an interesting journey to be part of. We now work very closely with a range of scholarly publishers, and it has been quite an experience learning how things 'work' from the inside. I still remain incredibly sceptical about

many aspects of our scholarly publishing system (e.g., peer review), but now feel more able to challenge them effectively, and to also help find solutions.

The journey, however, has been pretty tough. Several people have directly called me and my views on open science "radical", and have even aggressively attacked them or made personal threats (publishers and academics alike). Annoyingly, it's rare events like this that tend to stick, rather than the overwhelming and continuous positivity generally received. Nonetheless, getting researchers to engage with either Open Science or ScienceOpen has been a gruelling task, and I leave ScienceOpen with a steelier skin and a few scars as a result. I guess this is the nature of the beast – campaigning for change is never easy. There is an incredibly powerful, entrenched status quo in academia and publishing, and they do not like to be challenged. Thankfully, there is an incredible community out there trying to shift the power dynamic. Thousands of passionate people, including the OpenCon and Force11 folks, and they have always been there for support, and to help combat the darkness when it creeps up.

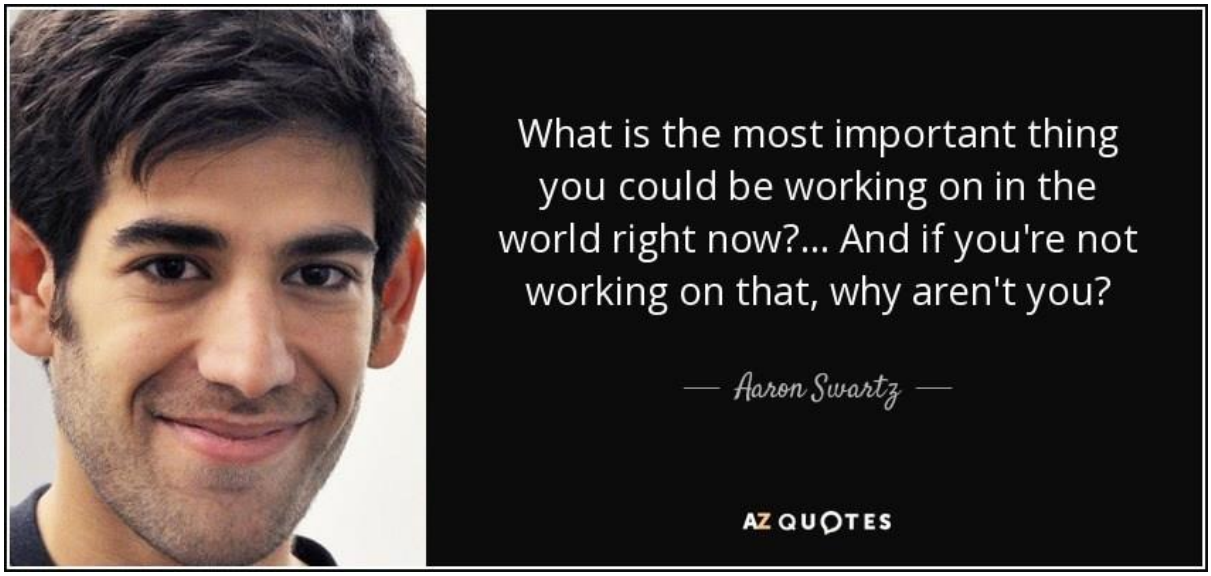
I feel that in no way am I a good communicator, not by a long shot, and likely never will be. Nor do I feel that all the things I think, say or do are correct. But the last two years have changed me quite a bit, and I feel more confident, more knowledgeable, and more effective as a person. A person who just wants things to be a bit better in science – a bit fairer, more equitable, more open. It's a process, and a personal journey that never stops!

Take homes from the experience

If I had to distil everything I've learned or done in the last two years into a few points about communications and community engagement, what would they be?

- Always listen first. If you want to get someone to do something, always listen to what it is they want or need first (or ask a question). How else are you supposed to find common ground to work from otherwise?
- Know when to shut up some times. Is your voice needed? By speaking out, are you stopping others from doing so? Silence can be a powerful ally.
- The whole ecosystem is defined by an unfathomable diversity of actors, the tensions between them, and gears and levers that form an incredibly complex machine. Find out where you fit in it, and what power you have to make change – you never know if you don't try!
- Being nice gets you everywhere. Radically nice if possible, especially when it seems most difficult.

- There is no one way to deliver a message, no one magic bullet that will work. Sometimes you have to try different tones. Sometimes you will meet resistance. That is totally okay – use every experience to improve yourself and get stronger.
- Never under-estimate the power of incompetence.
- Never over-estimate the power of evidence.
- People in this ecosystem are surprisingly human. They make mistakes. They have personal interests, morals, ethics, and agendas. Don't be surprised if someone has different views to you. Work with it.
- If you're meeting resistance, work out what the origin of that is. There's always a source, and when you find it, you'll know what the solution is. Which you will never, ever discover if you begin by thinking that you have the solution already.
- Picture the future. How are the actions that you perform today going to be judged in 10 years' time? Which side of history do you want to be on? Think tactically, strategically, and empathetically.
- The people who work on 'open science' are some of the best people I know. They are a frickin' beautiful bunch, all of them. The reason for this, I think, is because they are principled people, and realise how open science is itself largely based on principles, such as fairness, equality, inclusivity. They realise that the current system often does not possess these principles, and want to change that – because they see it as the right thing to do. I think.
- What do you believe in? What is the thing that is most important to you? Work out what those are, and dedicate your time to them. If you already know what they are, and aren't spending your time on them, why not?



I usually finish my presentations with this quote.

What is ScienceOpen?

Anyway. This is still one of the most common questions I get. I like to think of ScienceOpen as a playground for researchers. Its primary function has become search and discovery. But with this, come a dazzling array of features that allow users to experiment and interact with research in any number of ways – post-publication peer review, article recommendations, author summaries, and collection formation are some of the top ones here. Every user will have a different experience depending on how they choose to engage with research and other researchers.

Vital statistics

Since joining, I've written 128 blog posts, excluding guest posts and interviews, which I guess is kind of impressive. My favourite of these will always be the Open Science Stars series – conducting interviews with researchers from around the world to find out what Open Science means to them. This was an eye-opening experience, hearing the challenges, stories, and solutions people from all walks of life had, and helped me to personally gain a much more holistic insight into the world of Open Science. Thank you to all the Stars who participated in that series – keep on shining!

We're also at like 4,500 followers on Facebook, and about to hit the 10k milestone on Twitter – so close!

What's next?

Well, if you've read this far, it probably means you're at least vaguely interested still for some reason. For updates, you can follow me on Twitter (note: this account is highly, over-used – follow with caution), or simply email me.

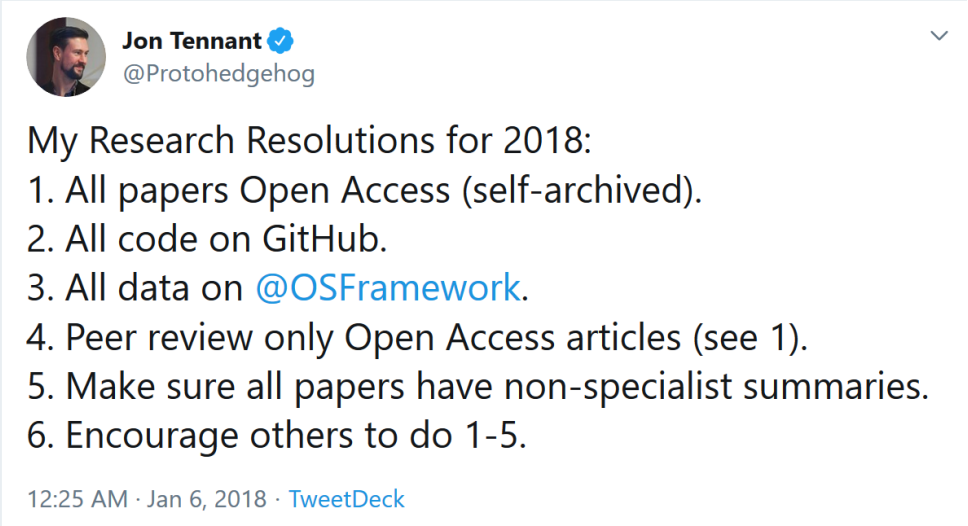
I'd like to finish by saying thank you. Thank you to the countless individuals who I've interacted with these last two years, all of who have helped me become a better person in some way. Thank you especially to Stephanie, Alexander, Tibor, Dan, Agata, Erzsébet, Nina, Erik, Jixin, Peter, and the rest of the amazing ScienceOpen team for letting me be part of this experiment with you all. It's been a fun ride, and I can't wait to see what the future holds!

Some of the ScienceOpen team at this year's Christmas Party.

2018

2018 Research Resolutions.

Yesterday, I tweeted some of my New Year research resolutions for 2018. It seemed to strike a chord with many, getting a lot of positive feedback. Oddly, I've been doing most of these since the beginning of my research career (I started my PhD in 2012), and I'm happy to say that it seems like the perception of these activities is improving positively!



Source.

I've decided to flesh them out a bit more here for 2 reasons. Firstly, to help me focus on what these commitments are and what they mean. And secondly, so that you all can hold me accountable to them!

1. Make sure all papers (past, present, future) are Open Access.

This one is remarkably easy, as all of my past papers are already Open Access. Ones that are in prep. are available as preprints too.

Sadly, I'm not affiliated with any institute any more, and have lost the bottomless pot of gold to pay for OA that I had at Imperial College. So, this will require several things:

- Collaboration with colleagues who do have access to funds.
- Choosing journals with fee waivers or no APCs.
- Exploiting 'green' open access policies and self-archiving my work. Thankfully, this is something fairly ubiquitous for Palaeontology journals.

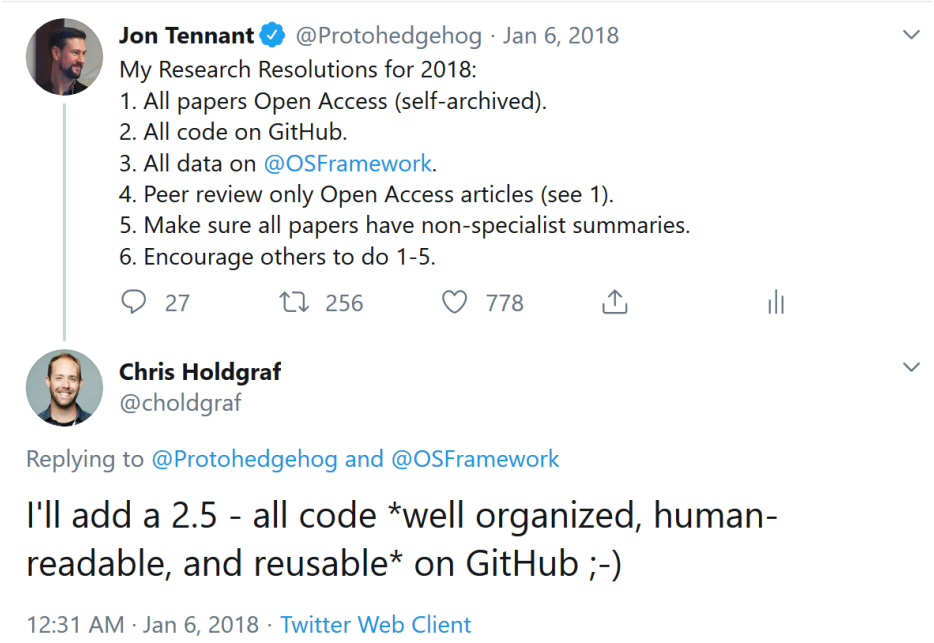
Problem solved!

2. Make sure all code is on GitHub.

I'm a woeful, woeful coder. Does this mean I shouldn't share any of it? Hell no. There are other people out there still training too, and we can all learn from each other's small steps. Everything we do for paleorXiv is also on GitHub.

Sharing code openly also makes a personal statement: "I am not afraid for you to analyse my data using my code, and find something new or wrong."

An added bonus from Chris Holdgraf:



Source.

3. Make sure all data are on the Open Science Framework.

Vicky Steeves also commented that it is possible to link GitHub repos to your OSF projects, which I'm happy to say that I tried, it works, and is awesome! All previously published data is openly available too.

Source.

4. Peer review only Open Access articles.

I can already hear the usual flames of retaliation being kindled: "*But what if people can't afford open access?*", "*How do you know if an article is going to be open access?*" The first of these is basically fake news by now (see point 1), and only demonstrates one's gross misunderstanding of the current OA environment. However, the latter requires some thought, as "hybrid" journals don't ask about OA until after acceptance in order to alleviate the editorial conflict of interest.

Your experience/thoughts may vary, but this is how I feel:

- If an article is in a pure OA journal, not a problem.
- I feel very reluctant to peer review for 'hybrid' journals anyway, as they're pretty awful.
- However, if I do, I can:
    - Make a recommendation to self-archive in the review report.
    - Email the author if possible to ask about OA.
    - Make self-archiving a condition to the Editor of accepting the review.

For every problem, there's a solution. You just have to think a bit. Different people and communities will have their own standards and practices, and it's up to you to find out what works.

5. Make sure all papers have non-specialist summaries.

It is not up to me to decide who might be interested in my work, and want to learn more about it. Common claims from researchers like 'The public aren't interested in my research' is a grossly ignorant and harmful view to take, unless you have personally surveyed the views of everyone on the planet.

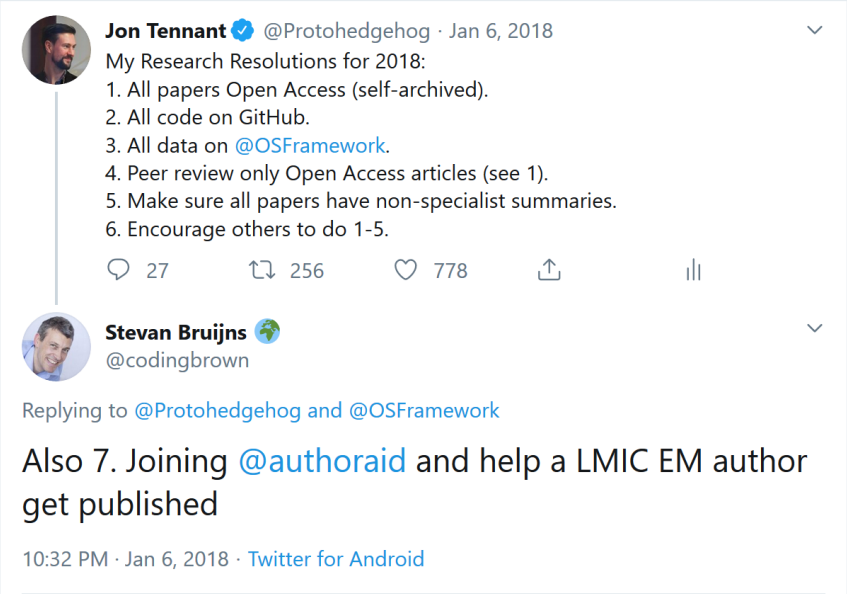
I feel that anyone who wants to read my work, should have the opportunity to do so. However, just making research papers freely available isn't always enough to do this, as often they are written with a target audience of specialists in mind (paleontologists). It is always worth remembering that your true audience and intended audience are different things.

As such, all research papers I have written in the past, and will continue to write, will also have non-specialist summaries blogged about them (which can be tracked using services like Altmetric, and shared on platforms such as Kudos/ScienceOpen).

6. Encourage others to do 1-5.

Because growth as a community is much greater than growing as an individual.

I also really liked this suggestion from Stevan Bruijns:



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Is the 'blockchain revolution' coming for science?

Blockchain, blockchain, blockchain. You can't go anywhere these days without hearing this buzzword. Now it seems that it is coming for science, and that's kinda exciting.

What is the blockchain?

To keep things simple: A blockchain is a continuously growing and immutable list of records (blocks), which are linked (chain) and secured using cryptography. Each block typically contains a cryptographic hash of the previous block, a timestamp and transaction information. Together, these blocks form an openly distributed, peer-to-peer (decentralised) 'ledger' of records between different parties.

At the APE meeting in Berlin in January 2018, the audience were asked when do they think the first blockchain-based services would be available for scientific research and communication. Most thought 2-5 years, based on the small proportion who genuinely understood what the potential disruptive power of decentralised technologies were. Turns out we were all wrong anyway, as these things are being built and exist right now!

In the last 2 days, **FOUR** new science-oriented services independently came to my attention. So, it seems like momentum is certainly gathering:

- Scienceroot: The first blockchain-based scientific ecosystem. Hosting a collaboration platform, funding platform and journal (Twitter).

- Open Science Network: A shared open protocol on the blockchain where researchers, universities, companies with R&D budgets and government institutions can interact effectively with lower barriers to entry and reduced friction in each step of the process (Twitter).
- Ivory Publishing: Open-access scientific publishing platform built on blockchain technology (they don't seem to have a website yet, but it does have an elephant for a logo).
- DEIP: A decentralised research platform (Twitter).

These new services join a bunch of existing ones such as the PLUTO Network and Aletheia, all designed around disrupting the way we perform and communicate research.

Why is this important?

Blockchain-based services, and those based on similar technology, are what we call 'decentralised'. This means that services and power/control are taken from a single point and distributed across numerous local points instead. This means that there is no single point of failure, and that services/control become owned by community-based structures instead.

Can you imagine legacy publishers like Wiley, Elsevier, and Springer Nature being too happy with that? I can't. Elsevier, and others like Digital Science, are trying to pull researchers into a system where they control the entire research workflow, from data collection all the way through to evaluation (more on this here). Great for business, bad for science, and especially scientific freedom – a basic co-opting of 'open science'. Decentralised services, therefore, provide an alternative to this, and a highly disruptive potential.

So, well worth watching future developments in this field. If you want to learn more, check out the 'Blockchain for Science' initiative, spear-headed by Sönke Bartling.

Sharing your work on paleorXiv is now even easier.

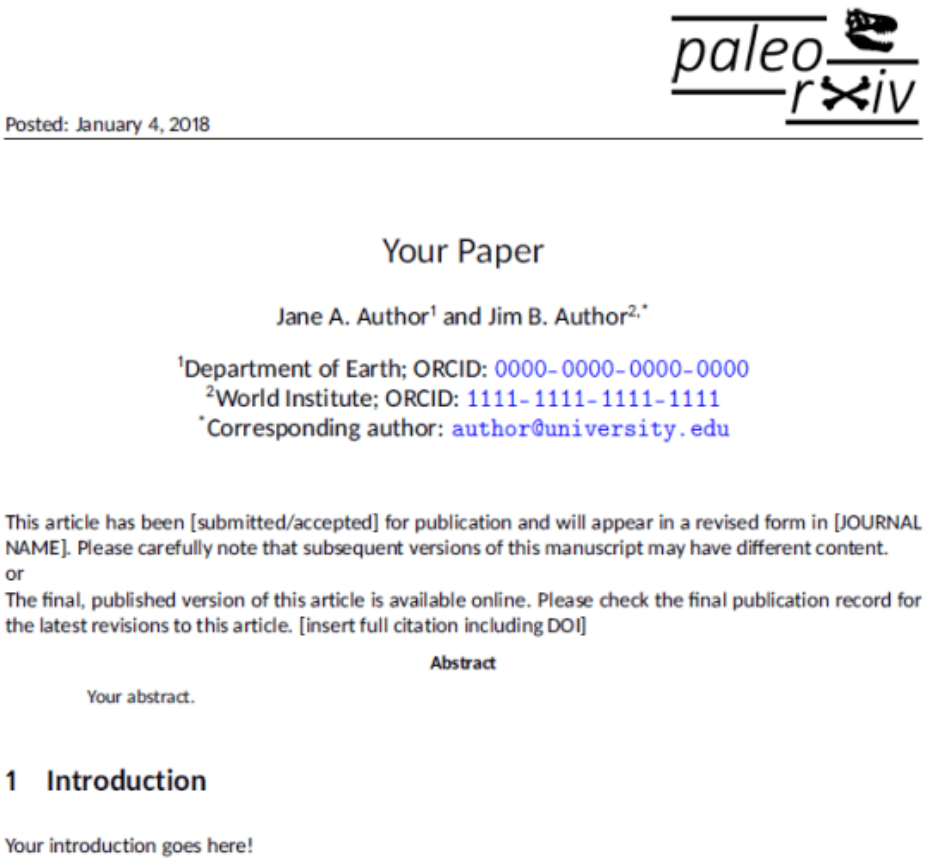
Our mission at paleorXiv is to make the open sharing of paleontological research as simple as possible for researchers. We've published 65 articles already, and one of the most common pieces of feedback we get is how easy the process is, often only taking a few minutes. For the typical submission process, all you need are:

1. The file you want to share (preprint or accepted manuscript, PDF or text);
2. The final published DOI (where applicable);
3. The article abstract;

4. The article keywords; and

5. The names and emails addresses of your co-authors.

That's it! Click submit, and then we'll check it for journal compliance and it'll be immediately made available online if it is. Free for authors, free for readers, thanks to the Center for Open Science. If you're sharing a preprint, there's nothing stopping you from sending it on to a traditional journal.



Posted: January 4, 2018

Your Paper

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This article has been [submitted/accepted] for publication and will appear in a revised form in [JOURNAL NAME]. Please carefully note that subsequent versions of this manuscript may have different content.
or
The final, published version of this article is available online. Please check the final publication record for the latest revisions to this article. [insert full citation including DOI]

Abstract

Your abstract.

1 Introduction

Your introduction goes here!

Overleaf template

Collaborative writing and publishing made simple

Now, we've made this sharing process even easier. The folks at Overleaf, a collaborative writing platform, have **created a new template** for direct submissions to paleorXiv, using a consistent format. You can open it directly as a template in Overleaf, or download as a PDF and work from there.

If you choose to use the template in Overleaf, you can then write and edit your paper in either rich text or latex format – all online, so you can work in real time with your colleagues! The final paper is automatically rendered live as you work so you can see the finished product.

After you've finished, simply click 'Journals and Services', scroll to paleorXiv, and click submit. You'll get all the source files as a zip file, and the final paper as a PDF, and then taken to the usual submission portal.

After this, if you want, you can add all the raw files (data, code, images, tables) to the article as an OSF project. Simply scroll to the bottom of the article page, and it's right there. You have unlimited storage space, and can connect to other services like GitHub and Figshare too.

Sharing your research outputs has never been this easy.

The ethics of copyright transfer for scientific research.

So, I've been thinking a bit about copyright issues with scholarly research recently, and have a few questions about the ethics of copyright transfer. Typically, the process of copyright transfer for research articles happens something like this:

- Researchers submit a manuscript to a journal for peer review.
- Should that paper be accepted for publication after peer review, the publisher requests that authors transfer copyright to them.
- This usually is a condition of publication – no transfer, no publication.
- The corresponding author, or the author in charge of submission, signs a 'copyright transfer agreement' (CTA) with the publisher.
- This transfers all rights to that content from the authors to the publisher.

This is the typical scenario unless the article is for an Open Access journal, but even then sometimes copyright transfer is still required (e.g., this paper of ours published by Cambridge University Press). The process will vary a bit between publishers, but this describes the general situation.

It seems that many researchers still do not fully understand the implications of this process to me – I mean, it's a bit complex after all, and more like an annoying final hurdle in the publishing process. Like accepting the terms and conditions for an iTunes update – no one really reads it, or understands it. For example, we often see things like researchers complaining when they are asked by publishers to remove final version copies of their papers online. Well, you know what signing a copyright transfer agreement does? It transfers your copyright to someone else, and publishers are then well within their rights to ask you to remove copies. It's not exactly the smartest tactical PR from publishers, but it does happen – look at the ongoing ResearchGate scandal, for example.

What does this mean

Based on this process, the following key questions arise to me:

1. Should researchers be allowed to sign away the rights to publicly funded research (or otherwise) in the first place?

2. Should just one author (usually) of a paper be allowed to sign away copyright on behalf of all authors? And often potentially without their knowledge or consent?

3. Should copyright transfer be allowed to happen *after* acceptance as a condition of publication?

This third question is most important to me, as it reveals an incredibly strong power imbalance on the process. Under this scenario, rights are less 'transferred' and more acquired, almost seemingly by blackmail ('no transfer, no publication'). At the moment, because this 'request' happens after acceptance, it is virtually impossible to decline. No researcher, after going through the laborious process of submission and review, will want to do anything to potentially delay the sharing of their findings, or compromise their chances of being published. This is because publishing articles counts for so much for career progression, it would be career suicide to decline.

So why are researchers not made aware prior to or during submission that this will be a conditional step of publication? The process could be changed to something as simple as this: During article submission, a simple box which asks "*Are you aware that, should your article be accepted, you will be asked to transfer all rights to your research to the publisher? This will have implications such as x, y, and z.*" Yes/No. Here, the major legal implications of this should be made absolutely clear, such as authors not even being able to share the final published versions of their own work.

Potential impacts

I imagine some of the possible consequences of this could be:

- Authors refuse to submit, and select a different journal instead (e.g., an Open Access one).

- Authors become more aware of the implications of copyright transfer, including the restrictions on sharing.

- Authors become more aware of self-archiving (or 'green open access') options.

- Authors challenge the copyright transfer process more generally.

- Authors don't care or don't mind, and submit anyway.

- It becomes conditional for all authors to sign any CTAs.

- Publishers are forced to be more explicit up front about copyright transfer, instead of concealing it towards the end of the process.

And what happens if an author should choose to decline the agreement? Well, the publisher then can simply say they won't publish their article. In which case, they have to go through the whole cycle again. Or, the publisher might ask for a different agreement such as the exclusive rights to publish, with the author retaining some of their rights. However, I'm not sure it is documented anywhere how frequently this has happened in the past, or whether using rights-retention tools such as the SPARC author rights addendum is widely successful.

So, my question is, how ethical is all of this? And why is no-one asking these questions of the scholarly publishing industry?

Why is this important

Well, imagine if it turns out that the basis for many copyright transfer agreements became null and void due to improper acquisition. This would mean that control of research articles could be regained by authors from scholarly publishers. Even entities like Sci-Hub could ultimately become legal! This could potentially free an enormous amount of published research to the public, which would be great. It could also have severe ramifications on the scholarly publishing industry, who largely rely on the commodification of these copyrighted articles as their primary products.

Now, I'm a palaeontologist, not a copyright lawyer, so am not an expert on these matters by any means. But I think something here is iffy, and could do with further discussion or investigation.

What do you think?

So, a few questions that would be great to get some feedback on from the wider community:

1. Do you ever feel like you were ever pressured to assign copyright under duress from a publisher?
2. Did it ever transpire that you signed your copyright away without even realising?
3. Were explicit conditions ever made clear to you about the implications of copyright transfer?
4. Would you submit to a journal, knowing that at the end they would request transfer of copyright?
5. Did you ever question a publisher about any of the above, and if so what was the response?

The elephant in the room here is whether or not it is even ethical for commercial entities to own the rights to scholarly research outputs. But that's a whole other conversation for another time.

Why the term 'Article Processing Charge' (APC) is misleading.

The term 'article processing charge', or APC, is ubiquitous in discussions about Open Access. It refers to the author-facing charge levied by many publishers in order to make an article freely available on their website. Now, putting aside the fact that this system actively discriminates against less-wealthy authors and institutes, I think that the term APC itself is incredibly misleading. Furthermore, I believe that this misdirection occurs in favour of publishers, to the detriment of all other parties. Hopefully in this post, I can explain why, and offer a potential solution to it.

Definition of an APC

Wikipedia defines an APC as: "*An article processing charge (APC), also known as a publication fee, is a fee which is sometimes charged to authors to make a work available open access in either an open access journal or hybrid journal*."

The average APC for hybrid journals has been calculated to be almost twice as high as APCs from full Open Access publishers, and APCs range from around $8 to $3,900. This charge must cover two main aspects:

1) The *indirect* costs of running a publishing business. This includes salaries, web-hosting and maintenance, advertising, and marketing, among other things.

    a) Note that this section also includes profits, which are removed from any of the internal processing and costs by shareholders. For example, with a profit margin of 30%, and an APC of $2100, $630 of that APC goes straight into shareholder pockets.

2) The *direct* costs of processing and publishing an article (e.g., editorial work, copy editing, typesetting).

The real cost of article processing

Now, I see several major issues with this current system.

- That the same APC is applied indiscriminately to all articles published in a journal, independent of the true indirect and direct costs associated on a per-article basis.
    - As an analogy, this would be like going to a mechanic, and being charged the same universal price to fix your car, irrespective of the actual work involved. An oil change would cost $2000, and so would having your engine replaced.

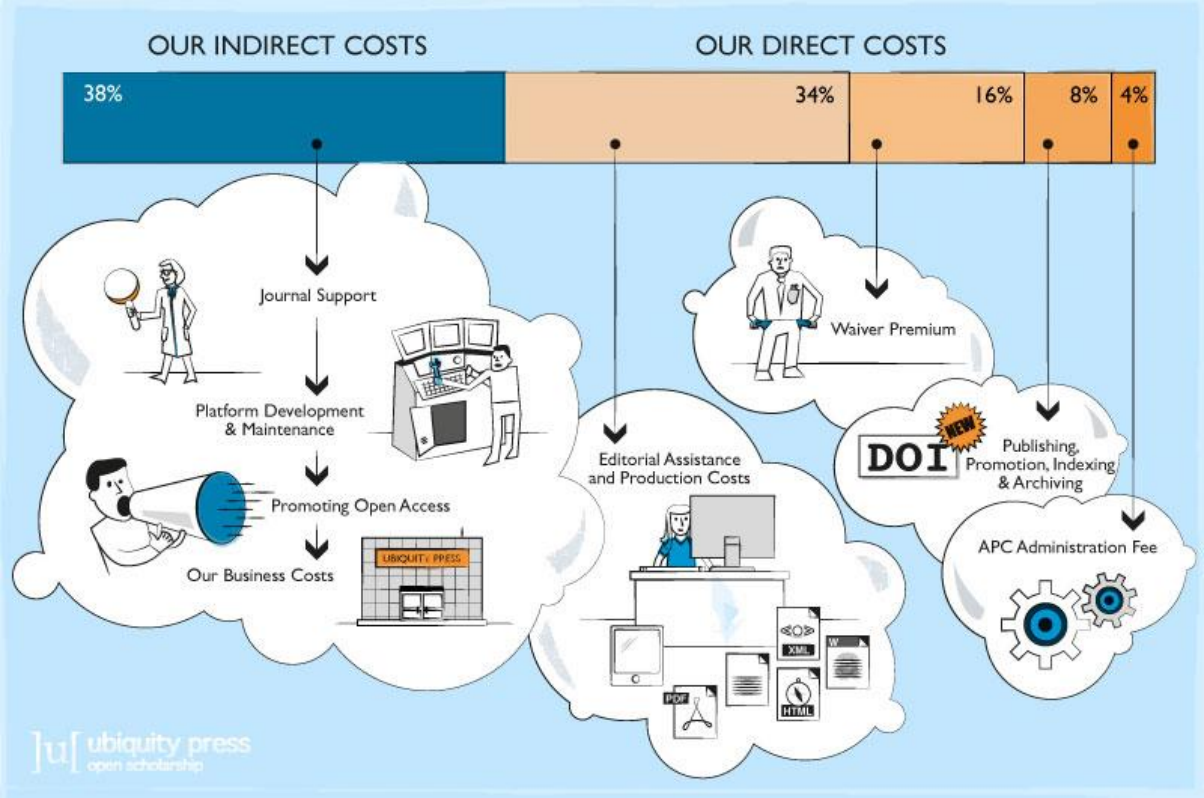
- In most cases, it is completely obscure what the cost breakdown is for an APC.
    - To use the above analogy, this is like getting the bill for your fixed car, with no idea what had actually been repaired.
- The APC is charged upon article acceptance, but the fee is decided on before an article is even submitted. It is therefore independent of anything which occurs subsequently to once the fee is set.
    - Again, this is like getting a bill from a mechanic for $2000, before they have even told you what the problem is or fixed it.

So, it doesn't make much sense at many levels.

Given the term "article processing charge", we might logically expect this definition to explicitly be about the cost of processing an individual article. Especially so since they are levied on a per-article basis (although now also often in bulk, which makes even less sense). However, it is clear that an 'APC' covers both the direct processing costs of an article, and the indirect costs of running the entire publishing business. Therefore, the term APC is itself misleading in multiple dimensions.

Transparency?

There are some exceptions to the second point, however. One of these is Ubiquity Press, and they offer a completely transparent cost breakdown below. They state: "*Our average base Article Processing Charge (APC) from only £400 (€450, $525) and this is the only thing we charge. In order to establish trust with authors, institutions and funders, we provide a transparent breakdown of how the APC is calculated.*"



From Ubiquity Press, with around 62% of the APC coming from direct costs.

Ubiquity Press is completely sustainable based on this, and their APC is around 25% of what many of their competitors at the large publishing houses charge. Others such as eLife and the Royal Society have made their costs transparent too. eLife estimates the 'fixed' and marginal costs of publishing per article to be £3,085, with £1,798 based on marginal costs (including paying editors and other staff, and maintaining online systems), but an APC of $2,500. It would be great to create a database of publishers and journals that are appropriately transparent about their publishing costs.

Can it be done more cheaply?

Yes, absolutely. Let's look at some simple examples.

1. The Journal of Machine Learning Research has an average per-article cost of $6.50. It does not charge an APC for this, and is supported by outside donations.

2. arXiv. Costs about $800,000 a year to run, with average costs coming to around $10/article (EDIT: for updated statistics, see here, thanks to Phil Gooch for pointing this out).

3. Discrete Analysis: "*The absolute worst that could happen is that in a few years' time, we will have to ask people to pay an amount roughly equal to the cost of a couple of beers to submit a paper, but it is unlikely that we will ever have to charge anything*." (Supported by the University of Cambridge for now, costs around $10/article).

All of these include the direct and indirect costs. There are many more examples than these few too.

Björn Brembs also estimates that the maximum cost for a scholarly article should be no more than $100: "..15 years ago a publicly financed solution was developed (SciELO) that publishes fully accessible articles at a cost of between US$70-200, depending on various technical details."

Another study from 2016 showed the following: "We found that an end-to-end scholarly communication solution can be provided exclusively by a combination of vendor services. Based on price data from 15 vendors, we found that the marginal cost of scholarly communication was between **$69** per article and **$318** per article. We found that these costs were not impacted by the different input formats used by authors (e.g., Microsoft Word or LaTeX)." (bold emphasis from me).

The only times in which higher estimates are made (usually in the ballpark of $5000), this is based on the total number of published articles divided by the total amount of revenue publishers derive. This is not an estimate of the cost of article processing, but of the average amount of revenue generated per article. Therefore, it is an estimate of how much it would cost to sustain that revenue stream through 'APCs', which would be decoupled from the cost of article processing.

How much can be saved if the true cost of publishing was known?

From Nature News: "*Data from the consulting firm Outsell in Burlingame, California, suggest that the science-publishing industry generated $9.4 billion in revenue in 2011 and published around 1.8 million English-language articles — an average revenue per article of roughly $5,000*."

So, back of the envelope calculation. What would happen if the global research community wanted to publish 2 million articles in 2018, and utilised systems modelled on arXiv, Discrete Analysis, and JMLR, which expose the true cost of publishing at different scales (around $10). That would cost in the region of $20 million in total. Which means, in theory, we could save around $9.38 billion a year by switching to an efficient Open Access publishing system. Here, the APC would be a real APC, reflecting the per-article processing cost, including direct and indirect costs. It would be about $10 per article.

Even if we multiply this by a factor of 10 (e.g., to represent scale), the total cost would be $200 million, and we would save $9.2 billion a year. This would be to have 100% Open Access too, and overcome the slow growth that the system is currently experiencing: "*We estimate that at least 28% of the scholarly literature is OA (19M in total) and that this proportion is growing, driven particularly by growth in Gold and Hybrid*." (Piwowar et al., 2018).

Just to reiterate. **It is eminently possible to achieve 100% Open Access, while saving research institutes and the public purse more than $9 billion every year.**

Pre-empting the backlash to this

Now, people are going to argue against this price calculation, usually using several common angles. Let's deconstruct them here to save some time:

- "This doesn't take into account the cost of rejecting articles."
- "This doesn't take into account the cost of managing peer review."

Well, folks, if we're spending 99% of our global publishing budget on rejecting science (on solid or unsolid grounds, this ratio cannot be known due to editorial opacity) and managing a process where virtually the entire workforce are volunteers, then we are doing a pretty terrible job.

Another common counter-argument will be something like:

- "APCs are based on what the market can bear."

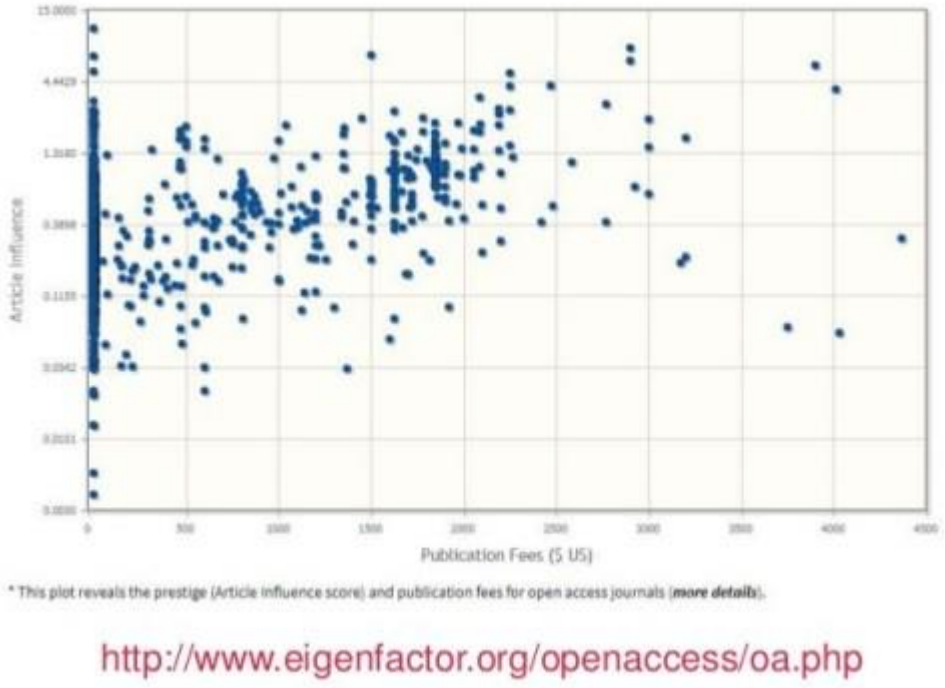
Well, this is actually quite deceptive, as there is no actual market for research articles. Markets work when there is price variation based on competition. However, that does not exist for scholarly publishing, as every single research article is unique, and therefore comprises a mini market in itself, with its owner having a mini monopoly on it. For example, if a research article costs $40 to access in one venue, you have to pay that, as that article is only available there; you cannot go to another vendor and pay a lower price for a similar article, because each research article is unique.

This argument is also just another way of saying 'We charge you as much as we can get away with. We like money.'

An extension of this is usually something like:

- "APCs reflect market value to researchers, based on the prestige/brand of a journal."

Seeing as this is decoupled from any real sense of scholarly value (e.g., real world impact), and the facade that corporate journal brands should mean anything in a rational research ecosystem, this point is also null. In fact, if what we are paying for is prestige (which research suggests we are), then we are basically being duped, and deserve to be in this pretty crap state of affairs. But upon recognising this, we should also get ourselves out of it, pronto.



From the Eigenfactor project. Correlation between 'journal impact' and APCs.

Where is all the money going?

Another serious question arises from this. How much more are the 'indirect costs' for publishers that charge $3000+ per article, and what are those costs associated with. We know that the *true cost* of article processing (i.e., the direct costs) are around $100, even at a high end. So, what about the rest?

Let's take Elsevier journals as an example. We don't know a breakdown of their direct or indirect costs. But let's be really generous and say that their direct processing costs are $500 per article. In the UK, their average APC is £1,863.26 (see Fig. 9 of this JISC report from 2016), which is $2609.41 at current rates. In 2016. Their adjusted operating profits in 2016 were 40%, so around $1043.76 of each APC went straight to shareholders.

So, $2609.41 – $500 – $1043.76 = $1,066.41. (APC minus processing costs minus profit = remainder).

So, if this remainder represents an estimate of the indirect costs, which amount to around 8 times that for a Ubiquity Press APC, how do/can they justify this? Alternatively, if we use the cost breakdown from UP, that around 62% of the APC comprises direct costs (i.e., processing), then that is still around $1600 for Elsevier, or 4 times the total APC for UP.

Either way you look at it, even after profits are accounted for, a lot of money is going somewhere. Some possible outlets include:

- Lobbying politicians, which they do, and spend millions each year on.
- Inefficient and outdated systems (contributing to high direct and indirect costs).
- Bloated salaries (their CEO takes in about $14 million a year alone).

Now Elsevier aren't alone in this. The same can be said of Wiley, PLOS, Taylor and Francis, and more, with adjusted calculations. If we compare it to journals that are even more cost effective than those published by Ubiquity Press, the story gets worse. Until we get transparency, we have to assume that these publishers are charging more for their own inefficiency. Clearly, APCs again do not reflect the true cost of processing an article. And even if they did, they would represent inefficiency again, if they were anything above $500 or so.

APCs are misleading, and combining this with the lack of transparency means that everyone suffers, except for publishers.

What needs to be done

The whole concept of APCs then, is largely redundant and misleading. It does not reflect the true cost of publishing, it does not reflect an efficient system of publishing, and it certainly does not reflect the actual cost of processing an article (with exceptions). There is also clearly no APC market, and therefore no pressure for an APC to reflect any of these things.

It is time for research funders and policymakers to recognise this, and implement some way of stopping it. Policymakers (e.g., at the national level) should be accountable to the wider public, not the whims of private corporations, and base scholarly publishing policies based on this. Their incentive to do this is simple: Getting more value for their money. Funding bodies that do not take into account the true variation in APCs, and the true cost of publishing, are doing an incredible disservice to research, and those who provide the funds for them to distribute.

Ideas for practical steps that can be taken:

- If a publisher is not 100% transparent about their direct and indirect costs, it cannot receive an APC. Transparency will help to create a functioning market.
- Based on the total range of APCs gained from this, a market cap could be implemented at some fraction of the highest APC (maybe 10%, tops). Any journal with an APC above this cannot be a recipient of an APC. This will actually force a system of price competitiveness to come into existence.
- There is enough money in the system, and enough evidence out there, to start experimenting with new more-efficient models.

Barriers to change

The only people who wouldn't want this are those in higher up positions at many publishers. Most who work in publishing probably want to offer more efficient, cost-effective alternatives. But feel they are powerless to create change within an organisation. I can't imagine the suggestion of a 90% revenue cut going down too well in board room discussions. Which in itself is exactly why this issue exists. A for-profit entity has no incentive to reduce its revenue or income.

Similarly, many researchers will feel they have little power in this issue (if they are even aware of it), as they are captive to the 'publish or perish' system. Also, most researchers are not accountable for paying these APCs themselves, and therefore insensitive to prices. On a personal note, I have spent around $30,000 of taxpayers money on APCs during my few years as a junior researcher, and do not feel great about it. I was not accountable to anyone, and I feel it is difficult to ask junior researchers to be the ones in charge of disrupting this system.

However, steps can be taken. Awareness is the first simple one for us all. For people with the power to change this, it is your civic duty to do so. The longer people with the power to do so let this abuse continue, the more they label themselves as irresponsible.

An alternative term to APCs – the SPF

So, are APCs misleading, as currently used? Yes. They do not tell us about the actual cost of article processing, and they do not actually relate to the explicit cost of article processing. **I suggest that the term 'APC' be much more strictly used to reflect the cost of article processing, and only under conditions when these numbers are known.**

For the majority of publishers, this means that they would not be able to use the term APC anymore to reflect their author-side fees. This includes publishers like PLOS, Elsevier, PeerJ, F1000, Wiley, Taylor and Francis, Sage, Springer Nature, and the American Chemical Society, etc.

Instead, for these journals, I recommend that we call what *they* call an APC something different. One idea for this could be the **Sustaining Publishing Factor**, or SPF. This would be simply based on their "APC" divided by the estimated true cost of publishing.

For example, PLOS ONE has an "APC" of $1,495; but this is not an actual APC, as we have no idea what their indirect or direct costs are. Hopefully the arguments above have made that clear. However, if we estimate that the actual cost of article processing is around $100 again, then PLOS ONE would have an SPF of 14.95. Nature Communications, with an "APC" of $5200 (before tax) would have an SPF of 52.

Here, the higher the SPF, the less value for money a journal offers, the more divergent they are from the true cost of publishing, and the more misleading their advertised "APC" is.

If a journal wants to change its estimated SPF, the only way to do so would be to be transparent about both its indirect and direct costs. Bring it on.

Elsevier are corrupting open science in Europe, The Guardian.

Open Science is all about making science work better so that it can address the world's challenges. It has been at the top of the EU's agenda for some time. The European Commission has the ambitious target of achieving Open Access to all scientific publications by 2020. The development of the European Open Science Cloud and Open Science Policy Platform indicate that Open Science has entered the mainstream, shifting the process and governance of scholarly communication.

Now, the European Commission have launched an Open Science Monitor to help provide data on the development of Open Science in Europe. To their credit, the Commission have been relatively transparent about the methods and data sources used for this and who is involved. They are also inviting comments to improve the indicators.

However, a cursory glance at the methodological note reveals something rather odd. The subcontractor for the monitor is Elsevier, the publisher and data analytics provider. Within scholarly communications, Elsevier has perhaps the single worst reputation. With profit margins around 37%, larger than Apple and big oil companies, Elsevier dominate the publishing landscape by selling research back to the same institutes that carried out the work.

It gets worse too. Throughout the methods, you can see that there is an overwhelming bias towards Elsevier products and services, such as Scopus, Mendeley, and Plum Analytics. These services provide metrics for researchers such as citation counts and social media shares, as well as data-sharing and networking platforms. There are now dozens of comments in the note pointing out the clear bias towards Elsevier and the overlooking of alternatives.

It is worth highlighting some of the key issues here that the Commission seems to have ignored in subcontracting to Elsevier.

First, Elsevier has a notorious history of campaigning against openness in order to protect its paywall-based business. In 2004, they submitted evidence to the UK House of Commons Science and Technology Select Committee on what they saw as the risks associated with Open Access such as threats to scientific integrity and research quality. In 2007, they were part of a PR campaign that connected Open Access to government censorship while lobbying the US Congress. In the USA, Elsevier supported a range of anti-open bills, including the Research Works Act (RWA), for which they made numerous financial contributions to members of the House of Representatives . All of this has stifled the growth of public access to knowledge and slowed the advance of Open Science, benefiting nobody except Elsevier.

Second, many EU member states are currently turning against Elsevier due to its anti-open business practices, high and ever-increasing prices, and dangerously powerful size as a commercial publisher. Research institutes are typically prevented from disclosing details of their 'big deal' subscriptions with Elsevier, as this would place downward pressure on journal prices. This profoundly anti-competitive practice has created a dysfunctional scholarly publishing market, and a budget crisis for university libraries. We are seeing national boycotts of Elsevier and rejection of Elsevier journal bundles. Just recently, Swedish and German research institutes announced that they were cancelling all Elsevier subscriptions due to concerns about sustainability, unfair pricing arrangements and a general lack of value.

If this wasn't bad enough, the conflict of interest of having an organisation that stands to benefit from the monitor by using its own services is so blindingly apparent that you have to wonder why Elsevier were subcontracted in the first place. How is it reasonable for a multi-billion dollar publishing corporation to not only produce metrics that evaluate publishing impact, but also to use them to monitor Open Science and help to define its future direction? Elsevier will be providing data through the monitor that will be used to help facilitate future policy making in the EU that it inevitably will benefit from. That's like having McDonald's monitor the eating habits of a nation and then using that to guide policy decisions.

Consider Elsevier's CiteScore metric, a measure of the apparent impact of journals that competes with the impact factor based on citation data from Scopus. An independent analysis showed that titles owned by Springer Nature, perhaps Elsevier's biggest competitor, scored 40% lower and Elsevier titles 25% higher when using CiteScore rather than previous journal impact factors.

Bianca Kramer, a librarian at Utrecht University, commented that the monitor should "*only include indicators that are themselves open, so data can be reused and results can be reproduced*." This is a fundamental part of responsible metrics and begs the question of why closed databases like Scopus feature so prominently.

With so many glaring issues, we should ask why the European Commission allowed this. It seems like a profoundly undemocratic practice to have a company with such an anti-open history now with such a powerful position in the future of Open Science in Europe. The risk here is that by using Elsevier services for such a crucial task, it creates a perverse incentive for researchers to use those services, and thus become dependent on them. This very real issue became apparent last week when Mendeley encrypted its databases, making it more difficult for users to access even their own data. Researchers could become trapped in a relationship with Elsevier in which they are the service and content providers, the product and the consumer.

It is a cruel irony that Elsevier are to be paid to monitor the very system that they have historically fought against. The European Commission should remove Elsevier as sub-

contractor and look into better options such as an independent group with no conflicts of interest. It is time to stand up to these ruthless mega-corporations before they corrupt Open Science.

Peer review, a golden standard? Co-written with Maria Ritola.

It is widely known among academics that the current peer review system is broken, or at least not working as well as it is heralded as. Systematic reviews shedding light on the topic are available (e.g. here and here), and reveal a system riddled with bias, privilege, functional flaws, and secrecy.

Peer review is of massive importance to the entire the system of scholarly communication through the validation that it provides. For a researcher, a single peer review can make or break their career, as peer reviewed articles are the principle currency within academic career progression. The system is supposed to be the part of the self-regulating scientific machinery where academic peers provide constructive feedback on research through expert analysis. It is meant to weed out poor quality scientific papers from being published. In reality, way too often these goals are not met, and there is a wide gulf between the ideal and the practice of peer review.

Flawed from the beginning

This is how the standard peer review process works: A researcher submits a paper to an academic journal. The journal conducts the initial review to check that it is in line with the scope of the journal. If the paper makes it to the next stage, it's sent off to the peers for evaluation. Most often, this is an anonymous process where the authors don't know who their reviewers are. For people on the outside, they also have no idea who was involved, or what was even discussed — the 'black box' of peer review. Hardly a strong basis for a rigorous, scientific process.

At present, the peer review is controlled by publishers of academic journals that also claim ownership to vast majority of scientific research. As only a handful of academics, selected by the journals, are allowed to contribute to peer review, pivotal insights that a fully open process would inevitably provide may be missed. Since, in many cases, the reviewers know who the authors are, but the authors don't know their reviewers, there's a risk that conflicted interests and biases favouring certain authors or affiliations come into play. Whatever way you look at it, peer review is not an objective process.

The length of the peer review process is another major issue. Reviewing a research article is a daunting task that takes a considerable amount of time and effort from the reviewer who

needs to get deeply acquainted to the problem space. Yet, apart from a few rare exceptions, reviewers don't get a compensation for the hours they put in, and it is the publishers who reap the profits from this volunteer labour. As a result, journals are finding it harder and harder to find qualified reviewers, and those who accept the request tend to prioritize their own research work and struggle to meet their review deadlines. Papers may be kept in the review process for months, in the worst case for years, often going through cycles of review and rejection at different journals until they finally find a home. This slows down not just the progress of science, but the career development of early-stage scientists too.

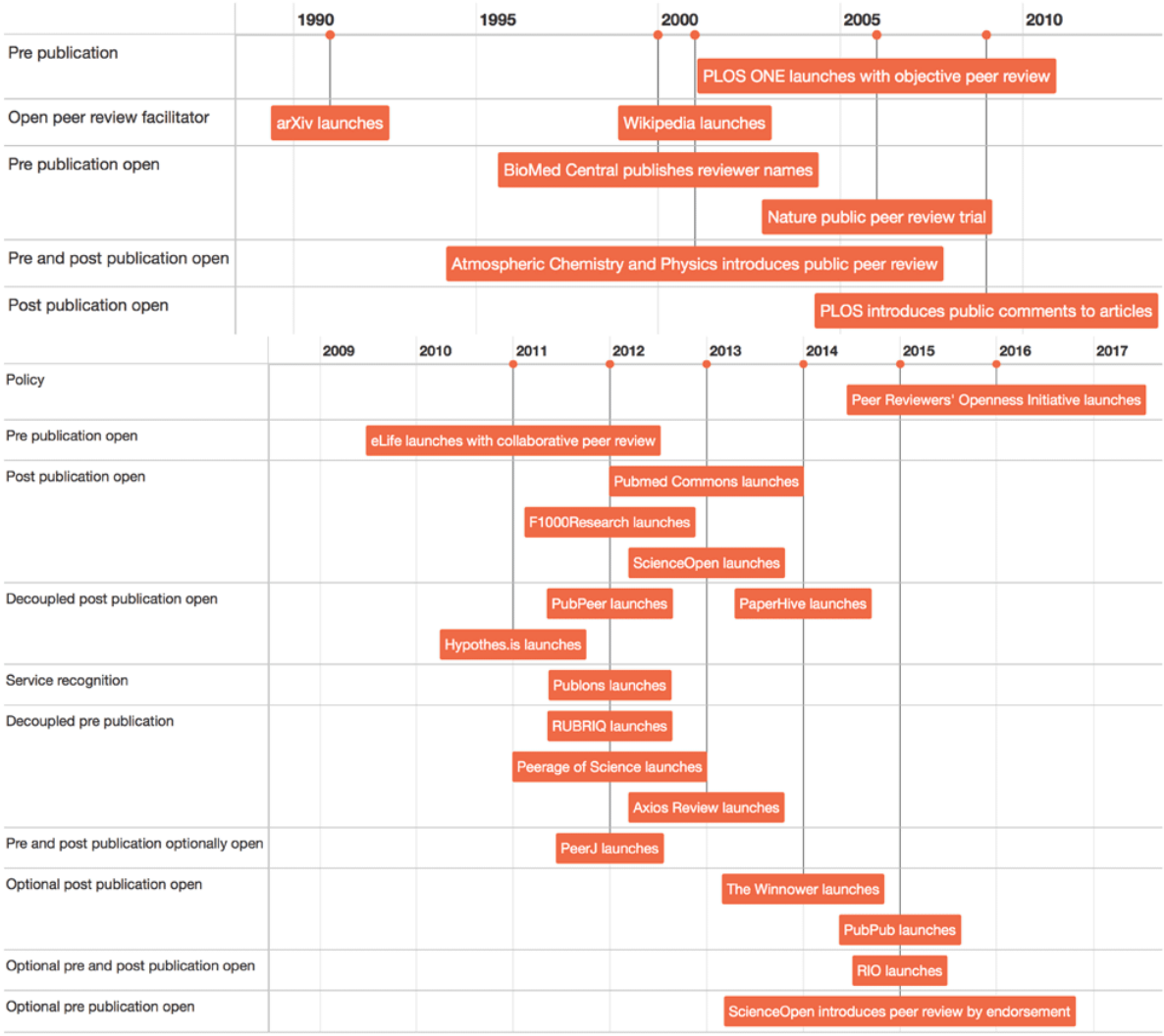
The future must be open

A transparent and open post-publication review system could help address some of the issues above. But levering the full potential of the crowd for comments and critique would require that they all had access to research papers; not just for the institutions with deep enough pockets to pay for expensive journal subscriptions, but for all. Many publishers, who maintain expensive paywalls and treat life-saving knowledge as a private commodity to be bartered with, are dysfunctional and serve none but their own greed.

As a response to the issues raised above, there has been a widespread wave of innovation around the peer review process in the past few years by the academics and newer open publishers from around the world. These largely revolve around three key themes:

1. Making the peer review process fairer and more transparent.
2. Making the process more interactive and dynamic.
3. Returning control of the process to scholarly communities.

Many of these innovations are focussed around something termed 'open peer review', and comes at a time when the entire scholarly communication system is undergoing major changes. Dozens of new services and innovative platforms have now emerged that are attempting to disrupt the journal-coupled peer review process.



Peer review: The revolution. An interactive data visualization is available at https://dgraziotin.shinyapps.io/peerreviewtimeline, and the source code and data are available at https://doi.org/10.6084/m9.figshare.5117260

Disruption through innovation

Many of the legacy publishers are content with the way peer review currently is. Why change something that has been inherently profitable for them for so long? Most of the innovations are coming from newer born-open publishers and start-ups that are embracing the power of Web-based technologies.

The community-owned Journal of Open Source Software uses GitHub to effortless manage its review process. Hypothesis is a Web annotation tool that operates across publishing platforms and journals, and has even been ambitiously described as a "peer review layer for the entire Internet". Other journals such as Ledger use blockchain technology to manage a

verifiable peer review process, while platforms such as Physics Overflow combine a Stack Exchange-based discussion forum with preprints.

With innovation running rife, you have to ask why so many researchers still seem to be in a state of cognitive dissonance towards journal-based peer review. "It's the best we have" is admittance of a failure to appreciate the explosive diversity in experimentation over the last 5 years, as well as decades of research that paints a very fuzzy picture of the peer review landscape.

Such an apathetic attitude towards peer review is deeply troubling. Imagine if a cancer researcher said the same thing: "This drug doesn't work, but it's the best we have, so we are going to stop looking for alternatives." This indicates that issues with peer review are not going to be purely sold by technology, but how different communities engage with it in a social context.

The future can be yours

You might have noticed that much of these innovations are still very journal- or article-centric. While that might not be such a bad thing, innovating on top of a 17th Century communication format is not very, well, innovative. Surely there are ways we can innovate further beyond articles, journals, PDFs, and closed systems. There are still a range of cultural and socio-technical barriers to overcome, and this is where you come in.

At Iris.ai and Project Aiur we're gathering new ideas to fix the challenges around peer review through the Aiur Airdrop campaign. We'd love to have you join us by submitting new ideas! Aiur tokens will be distributed for everyone who sends an idea and gives their vote for the best ones. Detailed instructions to participate are available here.

Scholarly publishing is broken. Here's how to fix it, Aeon Magazine.

The world of scholarly communication is broken. Giant, corporate publishers with racketeering business practices and profit margins that exceed Apple's treat life-saving research as a private commodity to be sold at exorbitant profits. Only around 25 per cent of the global corpus of research knowledge is 'open access', or accessible to the public for free and without subscription, which is a real impediment to resolving major problems, such as the United Nations' Sustainable Development Goals.

Recently, Springer Nature, one of the largest academic publishers in the world, had to withdraw its European stock market floatation due to a lack of interest. This announcement came just days after Couperin, a French consortium, cancelled its subscriptions to Springer

Nature journals, after Swedish and German universities cancelled their Elsevier subscriptions to no ill effect, besides replenished library budgets. At the same time, Elsevier has sued Sci-Hub, a website that provides free, easy access to 67 million research articles. All evidence of a broken system.

The European Commission is currently letting publishers bid for the development of an EU-wide open-access scholarly publishing platform. But is the idea for this platform too short-sighted? What the Commission is doing is essentially finding new ways of channelling public funds into private hands. At the same time, due to the scale of the operation, it prevents more innovative services from getting a foothold into the publishing world. This is happening at the same time as these mega-publishers are moving into controlling the entire research workflow – from ideation to evaluation. Researchers will become the provider, the product, and the consumer.

A global community to coordinate and regain control – to develop a public open-access infrastructure – of research and scholarly communication for the public good is long overdue. The issues of governance and ownership of public research have never been clearer. Another isolated platform will simply replicate the problems of the current journal-based system, including the 'publish or perish' mentality that perverts the research process, and the anachronistic evaluation system based on corporate brands.

Researchers are still forced to write 'papers' for these journals, a communication format designed in the 17th century. Now, in a world where the power of web-based social networks is revolutionising almost every other industry, researchers need to take back control.

The European Commission has called for full, immediate open access to all scientific publications by 2020 – something often mocked for being unrealistic, and that current growth trends suggest we will fail to achieve. But it is unrealistic only if one focuses on the narrow view of the current system.

If we diversify our thinking away from the superficial field of journals and articles, and instead focus on the power of networked technologies, we can see all sorts of innovative models for scholarly communication. One ideal, based on existing services, would be something much more granular and continuous, with communication and peer review as layered, collaborative processes: envisage a hosting service such as GitHub combined with Wikipedia combined with a Q&A site such as Stack Exchange. Imagine using version control to track the process of research in real time. Peer review becomes a community-governed process, where the quality of engagement becomes the hallmark of individual reputations. Governance structures can be mediated through community elections. Critically, all research outputs can be published and credited – videos, code, visualisations, text, data, things we haven't even thought of yet. Best of all, a system of fully open communication and collaboration, with not an 'impact factor' (a paper's average number of citations, used to rate journals) in sight.

Such a system of scholarly communication requires the harmonising of three key elements: quality control and moderation, certification and reputation, and incentives for engagement. For example, it would be easy to have a quality-control process in which instead of the closed and secretive process of peer review, self-organised and unrestricted communities collaborate together for research to attain verification and validation. The recklessly used impact factor can be replaced by a reward system that altruistically recognises the quality of engagement, as defined by how content is digested by a community, which itself can be used to unlock new abilities within such a system. The beauty is that the incentive for researchers switches from publishing in journal X to engaging in a manner that is of most value to their community. By coupling such activities with academic records and profiles, research assessment bodies can begin to recognise the immense value this has over current methods of evaluation, including its simplicity.

How will we fund scholarly publishing? Well, it's a $25 billion a year industry: I'm sure libraries can spare a dime. Making a more just system of scholarly communication open-source means that any community can copy it, and customise it suit the community's own needs, driving down costs immensely. Furthermore, initiatives such as the Global Sustainability Coalition for Open Science Services (SCOSS) or a recent proposal for libraries to set aside just 2.5 per cent of their budget to support such innovative systems, offer paths forward. The possibility is real for creating something so superior to the present system that people will wonder how publishers ever got away with it for so long.

All of the technology and traits to build a hybridised scholarly commons infrastructure already exists. It is up to academic communities themselves to step away from their apathy and towards a fairer and more democratic system for sharing our knowledge and work. That is, after all, what research is all about. The question of publishing reform is not theoretically or conceptually complex. The future of scholarly communication depends more on overcoming social tensions and the training to defer to a powerful system embedded in global research cultures than on breaking down technological barriers.

Members of the academic community ought to hold themselves accountable for the future of scholarly communication. There are simple steps that we all can take: many have already done so:

1. Sign, and commit to, the Declaration on Research Assessment, and demand fairer evaluation criteria independent of journal brands. This will reduce dependencies on commercial journals and their negative impact on research.

2. Demand openness. Even in research fields such as global health, 60 per cent of researchers do not archive their research so it is publicly available, even when it is completely free and within journal policies to do so. We should demand accountability for openness to liberate this life-saving knowledge.

3. Know your rights. Researchers can use the Scholarly Publishing and Academic Rights Coalition (SPARC) Author Addendum to retain rights to their research, instead of blindly giving it away to publishers. Regain control.

4. Support libraries. Current library subscription contracts are protected from public view by 'non-disclosure clauses' that act to prevent any price transparency in a profoundly anti-competitive practice that creates market dysfunction. We should support libraries in renegotiating such contracts, and in some cases even provide support in cancelling them, so that they can reinvest funds in more sustainable publishing ventures.

5. Help to build something better. On average, academics currently spend around $5,000 for each published article – to get a PDF and some extra sides. A range of different studies and working examples exist that show the true cost of publishing an article can be as low as $100 using cost-efficient funding schemes, community buy-in, and technologies that go a step further than PDF generation. We can do better.

6. Use your imagination. What would you want the scholarly communication system to look like? What are all the wonderful features you would include? What can you do to help turn a vision into reality?

It is feasible to achieve 100 per cent open access in the future while saving around 99 per cent of the global spending budget on publishing. Funds could be better spent instead on research, grants for under-privileged students and minority researchers, improving global research infrastructure, training, support and education. We can create a networked system, governed by researchers themselves, designed for effective, rapid, low-cost communication and research collaboration.

Scholarly publishers are not just going to sit back and let this happen, so it is up to research funders, institutes and researchers themselves to act to make a system that represents defensible democratic values, rather than rapacity.

Making research evaluation processes in Europe more transparent, LSE Impact Blog. Co-written with Sarah Slowe, Gareth Cole, and Charlie Rapple.

Recently, the Scholarly Communications Lab at Simon Fraser University in Vancouver, led by Juan Pablo Alperin, released the first results of a study investigating review, promotion, and tenure criteria in North American research institutes. This project is among the first to provide any large-scale empirical evidence behind these guidelines (you can find the data here). Such research is critical in understanding factors like the adoption of open access and "open

scientific" practices, the reality of the grip of journal brands and impact factors, and a range of other incentives in scholarly communications.

One key finding is that just 5% of the guideline documents mentioned open access at all, or anything to do with the mechanisms behind it, and many of those seemed to equate it with the murky world of predatory publishing. This seems strange for a world which is rapidly moving towards an open access future.

Inspired by the work of Juan and his colleagues, the four of us recently submitted a proposal to the competitive Scholarly Communication Institute's TriangleSCI event, which this year is on the theme of "Overcoming Risk". Our proposal was focused around conducting similar research in Europe, to help inform discussions and policy developments in this arena across the region. However, sadly we did not make the cut, and were left thinking about what to do with the proposal. Well, we thought, why not release it to the wild and see what sort of feedback and response we get from people? The LSE Impact Blog seems as a good a place to do that as any, and, well, here we are. And here is our pitch.

Career advancement through promotion, recruitment, grant awards, and research evaluation procedures is repeatedly mentioned as one of the key incentives for researchers and their practices and behaviours. Nearly every conversation about changes in scholarly communication ultimately ends up at this point; in particular, highlighting research institutions that are slow to adapt to changes in modern research environments, and how the present system penalises those who innovate or adopt novel research communication styles, methodologies, and reporting outside of traditional disciplinary structures.

This has, reportedly, led to those pioneering new routes to achieving goals to feel undervalued or to see these as an "extra" or "add-on" interest rather than as part of their core academic role, as well as stifling experimentation with new forms of scholarly communication. These procedures are often reviewed annually at institutional level, but changes being (as we so far understand) incremental and relatively minor, with more fundamental reviews carried out rarely.

In a recent study, Moore et al., (2016) argued that "it is clear that evaluative cultures are operating without even internal consensus beyond a few broad categories of performance". This highlighted that, while there is a key push towards excellence, how that is measured or demonstrated is rarely defined. However, there is a general perception among research communities that one of the principle factors involved in this is that of journal brands or ranks, and their relative impact factors. How much this perception is grounded in reality is, however, largely unknown, due to a lack of quantitative evidence. Preliminary results from North America indicated that only 20% of institutes actually mentioned impact factors in their guidelines – much less than we would expect given the ubiquity with which it is often assumed.

There is also a perceived risk for institutions in moving away from a “standard” position. For institutions recruiting globally, and in competition for researchers with other equivalent institutions, there is an understanding that promotions criteria are broadly similar and thus unlikely to deter a potential researcher from accepting a position.

We want to conduct a research project to provide the data to confirm or refute the assumption that promotions criteria are comparable across the sector, and provide the basis for recommendations to help us move to a new status quo. While we recognise not everyone conforms to such criteria and guidelines, these nonetheless provide a useful indicator of what might be the cause of such behaviours, and whether or not practices are reflective of such guidelines.

Thus, our proposal is to address the following key question: what models or practices could be developed to help incentivise and reward innovation and diverse forms of scholarly communication and public engagement, while reducing the risk to those who are seen to be diverging from traditional modes of professional practices and advancement?

For this, we will seek to provide a rigorous evidence base which will allow us to:

- Evaluate current promotion and hiring guidelines throughout Europe;
- Identify key aspects related to scholarly communication;
- Identify how similar this is to researcher attitudes of “publish or perish” and the impact factor being the key determining factor for career advancement;
- Provide recommendations for concrete steps to take us beyond the impact factor and traditional outputs; and
- Ultimately, create a more informed system for how researchers are evaluated, recruited, and promoted.

As the basis for this, our aim is to firstly collect and review a range of hiring and promotion documents from across European higher education institutes and conduct a semantic analysis of the different traits and aspects related to scholarly communication included in them. This will lead us to identify what the current incentives are and the effect they have on scholarly innovation. Our intention is to replicate similar research currently being conducted at Simon Fraser University and provide a European counterpart to that project. We will also endeavour to provide insight into the unintended exclusion resulting from a narrow view of “what counts” as a research output for promotion, and how this is reflected in the architecture of institutional repositories, which often only cater to certain research output types.

In developing a more evidence-informed understanding of the current situation and processes, we can begin to identify best practices in scholarly communication, and align these with best practices in career advancement for those involved in administering and reviewing

such procedures. This can, in turn, help us to develop a more intimate understanding of research cultures around career progression, and the relationship these have with evolving academic practices. Ultimately, our aim would be to translate these into systemic behavioural changes that lead to a greater valuing of a diverse range of processes and outputs in the research landscape.

Call for action

We believe that such an important topic deserves cross-stakeholder engagement. This is why we, as people who represent a range of difference perspectives and experiences from across scholarly communications, invite you to be involved. It does not matter if you are a publisher, student, researcher, librarian, or policymaker – all it takes to be involved is a desire to help understand and reform the research evaluation system in Europe.

"Elsevier is trying to co-opt the open science space, and we shouldn't let them". Interview with ScienceGuide.

Should one of the major publishing houses be the sole involved private party in monitoring open science in Europe? No, according to palaeontologist and Open Science advocate Jon Tennant. In an opinion piece in The Guardian on June 29th Tennant criticized the European Commission for subcontracting of Elsevier in the so called Open Science Monitor. The latter aims to provide data and insights, and gather relevant indicators for the development of open science in Europe.

A decisive week for open science

Elsevier and the Lisbon Council – a think tank leading the consortium behind the Open Science Monitor – have since responded to Tennant's publication. In their response to Tennant Elsevier asks "why would anyone seek to exclude commercial players like Elsevier form their vision of open science?" In a press release addressed at science editor Ian Sample at the The Guardian Paul Hofheinz, president and co-founder of the Lisbon Council, calls the opinion piece "aggressive and misinformed".

Both responses have led to a heated debate on social media between open science advocates on one side, and Elsevier and the Lisbon Council on the other. In two detailed blog posts Tennant has provided a point-by-point rebuttal of the stated arguments of both Elsevier and Paul Hofheinz whilst simultaneously filing a formal complaint to the European Ombudsman. As of now the complaint has 867 co-signatories, and a response by the ombudsman is due in a little under four weeks.

That being the short history the question remains what is to happen next. In order to delve deeper into the subject matter ScienceGuide sought out Jon Tennant to ask him a couple of questions.

So, let's get right down to it. Why is Elsevier's involvement in the Open Science Monitor problematic in your opinion?

"Just to clarify, nobody is saying that Elsevier can't be involved in this evaluation. It's just that having them as the sole independent contractor working on this, coupled to the huge bias in the monitoring that they already have, is a problem. If they wanted to come on board together with someone from say Springer Nature, F1000 and a bunch of independent bibliometric experts that would be fine. It's having them in a sole position of power, which is inevitable if you only have one subcontractor, that is problematic.

Elsevier has a history of being incredibly anti-open. The open science movement basically started because Elsevier were destroying the research communication system. And now they are saying 'hey, let us monitor that for you. Are you kidding? Frankly this situation is just insulting. You really have to wonder what the European Commission and the Lisbon Council were thinking when they did this."

So, then what is the fundamental aspect of the complaint to the EU ombudsman?

"One of the fundamental complaints is that you have Elsevier, a publishing house, dictating which metrics are going to be used to evaluate open science. And using that to shape future policy. This is a process that is riddled with conflicts of interest and data biases and Elsevier is just not a reliable partner. What Elsevier is trying to do is to co-opt the open space."

What do you mean by trying to co-opt the open space?

"If you look at either the practices or the principles that Elsevier enables or follows you'll see that they have nothing to do with the open science principles. They don't promote equality, transparency, fairness or rigour, justice or anything like this. They do the exact opposite. What Elsevier are doing is twisting the statistics in their favour and then calling it open science.

They do it now under the guides of openness. But still 90% of the articles they publish are paywalled. They are objectively the biggest barrier-based publisher that exists. Their overall model is to create monocultures of publishing that are exclusive and detrimental to research communities. So, to call yourselves the biggest ally to open science is fairly insulting, incorrect, and it highlights where they are moving in their business model."

What business model would that be?

"They are in the middle of a huge structural reorganisation. If you look at their activities over the past ten years Elsevier has acquired some 340 businesses, from Mendeley to Plum Analytics , all related to the research workflow which they've stitched together. Underneath

this are these corporate articles that function as a way to 'lock in' researchers as soon as they come in. Elsevier basically mines their data and then sells it back to them."

So, do you think keeping score of metrics and selling this information back to for example governments or research institutes is going to be the future business model of publishers like Elsevier?

"I think it already is, and one has to think about what that means for a second. You have a publisher that is selling publication metrics as evaluation materials to the same people who provided them the material to publish. It's just such a huge cycle of conflicts of interest… It's just obscene.

And just take the encryption of the Mendeley database as an example of what will happen. In the latest update they've encrypted their entire database, and everyone was like 'Are you actually kidding me?' Now if people want to access their database, for data mining for example, they actually have to grant Elsevier access to all of your data, and only then you can pull it out yourselves. That is the definition of lock in.

Elsevier has stated that this was done to conform to the GDPR standards, but were unable to explain which article of the GDPR they are actually conforming to. Without there being any good reason for it they've basically encrypted 5 million users worth of data. You'd better provide some justification for it."

Now back to the European Commission, they surely are a party that holds open science in high regard, why would they have involved Elsevier?

"Indeed, the European Commission has had open science on their agenda for a while now, but the main objectives have always been for economic growth and innovation and development. If you look at the statement of the president of the Lisbon Council he seems to reaffirm those aims. He states that open science needs to be monitored for research and innovation. But open science can never really purely be about that."

As of today, the European Commission itself hasn't issued a response to either your opinion piece or to Elsevier's response but the Lisbon Council has. Why them?

"They are the leader of the consortium behind the Open Science Monitor issued by the European Commission. I checked the out the other day and they are a think tank with an enormous lobbying arm, twice the size of RELX [parent company of Elsevier, red]. They lobby on similar issues as Elsevier."

So, what do you make of the overall tone of the Lisbon Council's response?

"I don't want to comment on it too much but I read it a few times and I just thought: this is inappropriate. This is not the sort of professional conduct you'd expect from an apparently well-respected body. And that's why I stated in my response that I wasn't going to respond

to it as a matter of professional conduct. But take a step back. If you look at the way the president has responded, and Elsevier themselves have responded, there is nothing intellectual. There was nothing factual. That's why I didn't respond to the personal allegations. That I think is the only way you can combat this incredibly Trumpian way of going about it. "

So, what are you going to do next?

"Let me first say this has been a community action from the very beginning and everyone has been extremely supportive. We are currently considering our next options, one of which is to make the complaint to the European Ombudsman into a petition leading up to the response which is due in a couple of weeks.

Another option is to write a formal complaint about Elsevier's domination of this function and the EU scholarly publishing market place to the European Securities and Markets Authority. This would potentially be very effective if you consider the history. In 2002 a merger between Elsevier and another scientific publisher, Hardcourt, led the UK office for fair trading to investigate their market position.

At the time it was reported that "if competition fails to improve of should additional significant information come to light, we may consider further action." I think the time for further action is here."

Elsevier serves the global research community to deliver open science?

This article is a response to a piece written by Elsevier in response to an opinion piece I published in The Guardian, concerning the involvement of Elsevier in the European Commission's Open Science Monitor. Comments from Elsevier are provided in *italics*, and my responses to them are in **bold**.

Firstly, thank you to Elsevier and Dr. Nick Fowler, Elsevier's Chief Academic Officer and Managing Director of Research Networks, for taking the time to respond to my opinion piece on The Guardian. Dr. Fowler's response raises accusations of misinformation on my part. This is not the case – all the arguments I made were correct, cogent and relevant, as I will explain further below. The Elsevier response draws implications from perceived omissions in my original piece. Given the strict word limit set by The Guardian, it would not have been possible to address all the points raised by Dr. Fowler, even if they were all relevant. A full criticism of this would take much more space, which can perhaps be emphasised best in our *draft* complaint about this issue to the European Ombudsman. Nevertheless, I am happy to here fill in the gaps with further arguments and evidence which only strengthen my case, and further show the validity of my arguments. I will not respond

to the points in the response article which have little or nothing to do with the present issue (the Open Science Monitor).

The bid was, of course, part of an open procurement process as part of a competitive tender, a fact that Dr. Tennant fails to mention.

I am fully aware that Elsevier are subcontractors within a consortium led by the Centre for Science and Technology Studies, and also including The Lisbon Council for Economic Competitiveness and Social Renewal, and the ESADE Business & Law School: this information is clearly provided on the first page of the methodological note that was referenced within the article.

However, further details of the tender process are still fairly scant and non-transparent. The tender award notification is available online, yes, but the next public information was that Elsevier had been awarded it. So, this response misses out numerous key questions about the nature of the process. Some general points regarding the lack of transparency are better addressed to the EC (and will be in a separate communication to the Ombudsman), but are worth mentioning here as general grounds for the more specific criticisms of Elsevier's involvement as subcontractors:

- **How did the 3 bids received for the tender score on the specific criteria that were used to select the contractor? Why is this information not required to be made public?**
- **Who evaluated the suitability of each candidate? Were any independent external experts involved in the evaluation process?**
- **Was there a consultation process involved?**
- **Why are tenderers are only required to identify subcontractors whose share of the contract is above 15%?**
- **Was the identity of this subcontractor made known to the EU during the tender process?**
- **Was a risk analysis performed as to the ramifications of the choice of subcontractor?**

And some specific points focussing on the subcontractor themselves:

- **How do the consortium and the EU resolve the motivations of Elsevier, which have been historically anti-open in many respects, with the intrinsic motivations behind open science, including financing and governance? (Note: this point was also raised in my original article, and unaddressed).**
- **Who is accountable for the process itself, including resolution of internal disputes during (not just the performance of the contract as a whole), with the data providers**

(Elsevier), European Commission, and data analysts operating as three non-independent parties?

- **Given the EU's emphasis on Open Science, including Open Data, why is there (apparently) no requirement to insist that the Open Science Monitor must be based upon open data, open standards, and open tools (with appropriate licenses for accessibility) as a matter of principle?**

- **How will the comments on the indicators, many of which specifically also mention the bias towards Elsevier services (including my own comments), be handled as part of the consultation process?**

These are critical questions to be asked (and answered) during a time when there are large and ongoing disputes in Europe between the big publishers and universities, for which Elsevier have been a particular focal point of discord; another key point made in my article which remains unaddressed. There is widespread unease within the European higher education sector that the scholarly publishing market, and the contracts involved in them, are not being administered in a correct way (e.g., due to the anti-competitive nature of non-disclosure agreements), and therefore questions such as these are highly relevant at the present. It is less the responsibility of me to point out all of these issues, and more of the Elsevier, the consortium, and the EC to be fully transparent about this process.

More importantly, Dr. Tennant appears to be questioning the notion that a private sector company generally, and Elsevier specifically, can be a partner to science.

This is a misrepresentation. I am questioning whether Elsevier has too large a conflict of interest to be a suitable sub-contracting partner within the Open Science Monitor. This question, to which my answer is obviously yes, is predicated on Elsevier's oligarchic scope and complex portfolio of interests, which include publishing and other scientific workflow services (tied to specific business models and profit motives), as well as provision of metrics services. As a subcontractor within the Open Science Monitor consortium, Elsevier are clearly in a position to contribute to defining priority metrics, which decisions may favour their metrics, and/or publishing products in future.

He appears to doubt that Elsevier can usefully and impartially support the European Commission as it seeks to gather relevant and timely indicators on the development of open science inside and outside of Europe to understand trends in the field better.

Regarding impartiality, this is fully correct. The past actions of Elsevier are evidence to support this; perhaps the best most recent evidence of this was the demonstrated bias and COI associated with the CiteScore metric, which I mentioned in the original article (providing a detailed overview of all criticisms levied at Elsevier is clearly beyond the scope of the original article and this response). I do not believe that an organisation with such a clear COI can be impartial in this case, irrespective of whether the methods for data

collection, the data itself, and the methodological protocols are made transparent. The impact of this could be that better, alternative metrics are excluded from the Monitor, while increasing the market position of Elsevier, and potentially creating dependencies on their research workflow products.

The fact that the COI remains, irrespective of whether Elsevier are useful or not, is the key point that is not addressed here. Elsevier are now in a position where they will be monitoring and evaluating the very same science that they, and their competitors, sell as their primary products. Furthermore, the metrics and data sources used in the evaluation, are biased towards those owned and operated by Elsevier, which creates an inherent bias and COI, to the exclusivity of their competitors and other primary data sources. This key aspect of my article was not addressed by Elsevier.

Elsevier embraces the principles of open science.

Not really, it embraces its own version of open science, and simply asserting that they do does not make it so. Their track record in this regard is mixed at best, so that it might continue to enjoy its large profit margins; something well within its right as a company, but disingenuous to pretend it is about embracing open science. Indeed, a recent independent report found that Elsevier scores quite low in their openness assessment. I would love to hear how Elsevier is a supporter of fairness, equality, rigour, transparency (in pricing, for one), open source, zero-length embargoes, open data, transparent research assessment, open licensing (CC BY or CC-0), and open citations (or even just some of these).

At a more fundamental point, you have provided information that leads us to conclude that around 94% of Elsevier's annual article output is still paywalled content (see your comments, addressed further below). By preventing access to research, Elsevier actively inhibits the use of useful knowledge and tools that teachers, citizens, education unions, researchers, policymakers, and other potential users require in order to meet the everyday challenges of education systems, and our wider societies. Elsevier's business model of knowledge commodification undermines the basic principle that all people have an equal right of access to knowledge and education, irrespective of their background or status, but also explicitly discriminates against the financially underprivileged. I would welcome a discussion on how this demonstrates Elsevier's alignment with the principles of open science.

Advancing it is part of our purpose to serve science and health, and we have unequivocally committed to this publicly through actions such as signing on to the European Open Science Cloud.

While signing on to EOSC is great, actions will speak louder than words. So far, signing something that has not been even launched yet is not exactly unequivocal evidence to support a commitment to serving science and health. Of note, Elsevier have also not signed

onto initiatives like the San Francisco Declaration on Research Assessment (DORA). Elsevier have also explicitly ignored other open initiatives such as the I4OC (Initiative for Open Citations). Cherry picking examples to support Elsevier's stance, while ignoring evidence to the contrary, is not a strong basis for arguments.

Furthermore, Elsevier have an incredible history of anti-open lobbying, stifling the development of open science primarily in the UK and USA. Many of these cases were mentioned in my original article, but there are numerous others that I also could have selected from. Now, the response from Will Gunn on Twitter was that these cases are more than 11 years old now, which is correct. However, they came at pivotal times during the development of OA, and trying to dismiss them, as well as the current impact they have, is not helpful. Also, Elsevier only withdrew their support for the notoriously anti-scientific Research Works Act (RWA) in September 2012, which is a relatively recent event. When things like trust and legitimacy are important for supporting the decisions of the EC in matters like this, history matters. Perhaps Elsevier could also shed light on the potential role that the 6 RELX lobbyists for the EC might have played in the developments of the Open Science Monitor.

That is why we receive 1.5 million new article submissions every year — a number that keeps growing: because researchers want their article to be one of the 400,000+ submissions we accept for publication each year.

No-one doubts that Elsevier's numbers are impressive in this respect; especially in that it rejects more than 1 million research articles every year. However, such a high volume is more due to the perverse focus on high impact publications for career assessment and progression. Elsevier has helped create this environment where the focus is on the container and not the content, as selling such publications is still its primary revenue source. The role of the Open Science Monitor is actually to move away from such indicators towards a fair and more responsible rewarding system for researchers within an Open Science system – something also recommended by the EC Working Group on Altmetrics. Therefore, touting this as a success factor justifying Elsevier's role in the Monitor is counter-intuitive and contradictory to its primary purpose.

We are one of the leading open access publishers, and we make more articles openly available than any other publisher.

OK, it does not matter how many times this is said, but this is called selective reading of data. In 2012-2015, Elsevier published almost 1.4 million research articles. In 2016, it published 25,000 Open Access articles (27,000 in 2017). If it publishes now 400,000 articles a year (as stated above), this means that the vast majority of its content is still paywalled. If Elsevier want to call themselves a leading OA publisher, the same data indicates that they are still virtually the largest paywall-based publisher, publishing around 375,000 paywalled articles each year. Proportionally, this means that around 1 in 16, or around 6% of Elsevier's

articles are actually OA; which many might say makes it one of the smallest OA publishers, when so many now have 100%. This also clearly does not lay credence to your claim that Elsevier are embracing open science.

Note, that these articles often do not even fulfil the widely accepted requirements for OA, as authors are asked to transfer 'nominal copyright' to Elsevier, which in essence is almost the same thing as a traditional copyright transfer. Furthermore, the vast majority of these articles are published in hybrid journals. This is now becoming widely recognised as an unsustainable approach to OA, and did not have any of the intended effects that were first articulated (e.g., in creating a transition to full OA, and creating a functioning market around APCs). Calling yourselves a leading OA publisher is factually incorrect, and again also ignores the history of lobbying against progressive OA policies.

We make freely available open science products and services we have developed and acquired to enable scientists to collaborate, post their early findings, store their data and showcase their output.

Again, simply providing tools for science does not make them 'open science'. Free is also not equivalent to open, as the open source movement clearly has demonstrated.

We make Mendeley — a reference manager and collaboration solution — freely available for the millions of researchers that use it while also adding free data search and storage services.

There is little guarantee from Elsevier that this will always be the case. Will Mendeley always be freely available? The fact that in a recent update, Elsevier encrypted its databases, does not lend much faith to this. However, it certainly is not within the spirit or principles of openness. And seeing as Scopus features predominantly within the Monitor, will there be plans to make this freely accessible now too? Otherwise this is a clear violation of the principles of open science again.

We also acquired and developed free-to-use Plum Analytics and NewsFlo to make research metrics more inclusive.

It remains inherently unclear what is meant by 'inclusive metrics' here. For me, inclusivity as an intrinsic part of open science, and I fail to see how Elsevier align themselves with this, based on the numerous comments above. However, it is clear that Elsevier are moving into the data analytics scene, as part of a business-wide strategic reorganisation.

We have co-developed CiteScore and Snowball Metrics with the research community – all of which are open, transparent, and free indicators.

And which are also biased towards Elsevier. As I mentioned in the previous article: "An independent analysis showed that titles owned by Springer Nature, perhaps Elsevier's biggest competitor, scored 40% lower and Elsevier titles 25% higher when using CiteScore

rather than previous journal impact factors." This does not lend support to Elsevier products being unbiased towards themselves (or impartial, as mentioned above), and against their competitors. Transparent or not, and irrespective of the motives, this is unacceptable, and a clear indication of inherent bias within the data and metrics.

The largest pre-print server in Social Sciences — SSRN — is free for use, and we have extended it across many other subject areas to enable the free posting and circulation of preprints in those disciplines too. Elsevier's bepress and Pure enable universities to automate the hosting of manuscripts and datasets in their institutional repositories for readers to access for free.

OK, I did not mention any of these aspects during my article, but will comment on them here anyway, as it is important to challenge these assertions. Firstly, as history tells us, just because a product is free now, it does not mean it always will be, especially when controlled by a commercial entity. Secondly, many consider these services mentioned to be 'trojan horses' to enable Elsevier to infiltrate and control parts of university systems; even Steven Harnad, a prominent leader of the Open Access community, has echoed this, calling Pure self-interested and exploitative. An article on Elsevier's own website states that the community remains divided over the acquisition of bepress too. Thirdly, Elsevier has pulled perfectly legal content from SSRN, without even notifying the authors. Either way, this does not appear particularly relevant to the Monitor.

For that reason, the consortium was careful to exclude a bias towards Elsevier products in the monitor's methodology – another point ignored by Dr. Tennant.

I am not quite sure what this means. The bias is so clearly apparent in the methodology with Elsevier as the sole subcontractor. Section 2.1 is dominated by Scopus, over all competitive services, including those such as Web of Science or Dimensions; indeed, the replacement of Web of Science by Scopus is made explicit in the Annex accompanying the methodological note (pages 12 and 14). This exclusivity is clear, despite the well-known biases associated with using a single citation database for research evaluation purposes. Section 2.3.4 is also based entirely on Elsevier products. This is a bias which Elsevier stands to benefit financially from, and it is exclusive of Elsevier's competitors, which creates a fundamental COI.

In the comments that the EC is offering on the methodology, this bias is also repeatedly pointed out by numerous other individuals (myself included). I would advise the consortium to treat this issue with serious consideration, as it has serious ramifications for the future of Open Science in the EU.

By using almost exclusively Elsevier-based services, such as Mendeley, Scopus, and Plum Analytics, subcontracting to solely Elsevier creates an inherent bias in the data sources:

- **The potential direction and size of these biases is largely unknown at the present.**

- **This is partly a function of the products (metrics) and data themselves being proprietary, and an irresponsible approach towards metrics usage for evaluation. Such an action is against the recommendations of the EC Expert Group on Altmetrics/Next-generation metrics.**
- **The metrics proposed to be used for the monitor are not acquired by an independent body, but based on Elsevier products and services, creating an inherent bias in the data sources.**
- **The fact that Elsevier is a publisher offering services that monitor scholarly publishing also presents a serious conflict of interest, and does not respect current competition laws.**
- **This also actively discriminates against the competitors of Elsevier, creating unfair market conditions around Open Science evaluation and metrics.**

Why would anyone seek to exclude commercial players like Elsevier from their vision of open science?

This is another straw man argument. No one has said this. However, what I am fully aware of are several key things:

- **That Elsevier have an enormous history of fighting against the development of Open Science.**
- **That this fighting is still very much ongoing, particularly in Europe.**
- **That there is an inherent COI in having Elsevier monitoring Open Science.**

However, to answer your question honestly, here are some potential reasons:

- **The recent EUA report demonstrating the amount which universities are currently spending on publishing, much of which goes to Elsevier.**
- **The fact that, now with the help of the power afforded to them by collective bargaining, university consortia are now cancelling contracts with commercial publishers, including Elsevier. This is also happening with individual universities, including in North America.**
- **As mentioned above, they have a profound history of anti-open lobbying. This history is not easily forgotten or undone.**

So, really, it is not 'commercial players like Elsevier', but really just Elsevier (and only in this instance), based on their unique history of business practices. And the follow-on issue that it is just a single entity being subcontracted, whether commercial or not, that creates further issues around biased data sources.

Given the $500 billion spent annually on academic and government research globally, is it feasible for the public sector alone to deliver the data, tools and services required for open science? How open can his vision be if it is closed to the possibilities offered by the private sector?

OK, two points here. The first sentence, I believe Dr. Fowler answers his own question: yes. But no one has said that we want the public sector alone to do this; and it is also not a clear-cut dichotomy between public and private sectors. Nowhere does anything about this appear in my article either, answering the second question, which is another straw man argument. Much of the rest of the article after this is not particularly relevant to the original piece, so I will not comment on it here.

Nonetheless, the two key points of my original article remain virtually unchallenged:

- **That there are substantial issues surrounding the transparency of the process for awarding of the subcontract to Elsevier.**
- **The COI that arises from Elsevier monitoring things that are related to the primary products it sells, to the detriment of its competitors.**

Now, I would love to believe that Elsevier has truly turned around and is now a devotee towards Open Science. I know that there are many talented people, with immense knowledge and skills, under Elsevier's employment. However, this post does not convince me of such a turn, and instead has been quite evasive of the key issues my original article attempted to convey. There is little evidence to support the assertion that my original statements were misleading or misinformed, and indeed, my responses here demonstrate that, if anything, the inverse is true.

If Elsevier wish to further discuss these two critical points that were raised in the original article of mine, and now expanded upon here, that would be welcomed.

Regards,

Jon

Preprints help journalism, not hinder it, Nature. Co-written with Laurent Gatto and Corina Logan.

In suggesting that preprints could distort the public's understanding of science, Tom Sheldon perpetuates the fallacy that peer review is a guarantee of validity (*Nature* **559**, 445; 2018). There are countless examples to the contrary (see, for instance, A. Margalida and M. À. Colomer *PeerJ* **4,** e1670; 2016).

A responsible journalist consults multiple independent sources to verify research findings. This critical evaluation is not contingent on the research having been peer reviewed. Preprints provide early and unrestricted dissemination of research outputs, so journalists can often peruse expert feedback when considering a story. And most preprint servers either label preprints as 'not peer reviewed' or have editorial 'sanity checks' in place to prevent the posting of junk science.

Plenty of peer-reviewed research papers contain errors. Preprints provide a chance to spot these and have them removed before publication. In our view, preprints and peer review are complementary.

Do we need an Open Science coalition? Elephant in the Lab.

Open Science is a strange concept. Depending on who you speak to, it can be a set of scientific practices, a social justice issue, a complete fad, part of a political capitalist regime, or just a different but undefinable form of traditional science.

This variety in thought is at once both a strength of Open Science, and its greatest weakness. Clearly a diversity of views on whatever Open Science is helps us to create a vision of what it is in reality as a boundary object– something that is universally understood and immutable only in part, so as to be taken up by diverse communities in a range of ways; something befitting from the great diversity of the scientific enterprise while retaining its integrity (Moore, 2017).

However, a lack of appropriate and common definition and understanding also opens Open Science up to exploitation. For example, if Open Science is just defined as a set of research practices, then providing services to support them can be deemed as Open Science. Indeed, the fact that many commercial entities consider Open Science to be a business model is quite divergent from the original purposes and intents, for example outlined in the Budapest Open Access Initiative (Poynder, 2012). Similarly, much of the political motivation for Open Science in Europe sees it as a mechanism for innovation and economic growth (European Commission, 2017). However, if one deems Open Science to include value-based dimensions such as equity, justice, as well as technical factors like open source, then many services that superficially appear to support open scientific practices are divergent from it in other ways. In fact, the Open Science community has yet to appropriately decide on what these core values behind (open) research are, and how this translates from good scientific practices and norms established in a non-digital age.

One example of this is the transition from subscription-based models to an author-pays model, which essentially just flips around the financial discrimination from readers to authors. Open Access has therefore not achieved much disruption of the present journal system, as

the ‘marketplace’ around academic value creation is still largely dependent on the same main players and their services. When definitions or understanding of terms about Open Science differ, this can create conflicts between different stakeholder groups. One consequence of this is that different groups often end up talking past or against each other, rather than finding common ground to work from. Therefore, we have to be mindful of our current actions and consider the implications that they might have on the whole global research ecosystem.

This lack of consensus leaves room for Open Science to become co-opted, as the ideology behind it can become diluted by political and/or economic influences. Open Access, a key part of Open Science, demonstrates this nicely in many respects, being based originally on foundations of knowledge freedom and equity, but now has become something academics are largely forced into with it becoming a complex maze to navigate, and which many publishers exploit for additional revenue streams. In Germany and Sweden, this lack of reconciliation between researchers/institutes and some publishers has now led to national-level cancellations of journal subscriptions due to a failure to agree on the appropriate costs and services (Else, 2018).

This divergence is something that is currently happening more broadly too. Open Science is not something under control of either the public (who largely indirectly funds research), as part of a democratic operation, it is not under the control of academic institutes, and it is not under the control of academics themselves.

A perfect example of this problem can be found with the largest scholarly publisher, Elsevier. Much of the motivation behind Open Science came from years of frustration aimed at the practices of Elsevier and its kin; yet now, they confusingly label themselves as promoting Open Science (Tennant, 2018a) to academics (Fowler, 2018) and policymakers, when the reality is that they are a corporate entity whose job it is to make as much money out of science as possible to increase shareholder value – a simple product of having commercial intentions manifest throughout the scientific endeavour.

There is little point beating around the bush here, and researchers must be absolutely aware that Elsevier are trying to dominate the total scientific landscape, to the detriment of virtually everyone else on this planet besides their shareholders. They do this through a clever strategy combining several key things:

1. PR campaigns illustrating how supportive of Open Science they are, while in reality only ever making tiny steps;
2. Twisting and cherry-picking published statistics to fit this superficial narrative (Tennant, 2018a);
3. Simultaneously fighting against Open Science in the public and political arenas, through active lobbying (Center for Responsible Politics, 2018);

4. Making sure that they are involved in virtually every progressive initiative in Open Science, in order to make sure they can control the flow of ideas and practices, while at the same time saying that they serve the needs of the same research community which they are controlling (Tennant, 2018b); and

5. Investing in all key parts of the scientific enterprise/infrastructure to gain ultimate control over research and their potential competitors (Posada & Chen, 2017).

Now, there are probably more things to add to this list. Elsevier will also vehemently deny these things, and upon reading this, if they should, I predict in advance that they use terms like 'misleading' or 'malicious' to describe these statements as they have done before, while they remain objectively true. No one is blaming the people who work or volunteer for Elsevier, they are simply greasing the capitalist machine.

So, what is the solution here? Who is going to direct the future of Open Science? Who is doing the educational, political, and practical work to support sustainable Open Science across all nations, disciplines, and demographics? It is not Elsevier, or any other publisher. They tend to do the opposite, or at least their own version of it, which is ultimately a corrupt form of the intentions or values of Open Science.

We have to acknowledge that this is a problem. If the challenges and issues of Open Science, or scholarly communication and collaboration more broadly, are not addressed, then this leaves them open to being co-opted. The inherent goals of Open Science also remain unclear, and what the roles of the different actors are. Many of the actors use the identity of 'stakeholders', a term corrupted by the fact the stake for some is financial, and for others it is not. Is Open Science a community, a set of values, or a movement? Or all of these things?

Many of these questions arise due to the simple fact that whatever Open Science is, it is not organised. It is not strategic, and it is not holistic. Even at a technical level, the fact that Open Science is what the Web was developed for almost 3 decades ago now, yet has failed to attain, should be ringing alarm bells everywhere. We live in a networked world where information dissemination is virtually cost-free, where social tools and services provide researchers with untold power in knowledge generation and communication. Yet we, as a collective, are not using this, and have not yet even agreed on a set of appropriate values and new technical norms. And we are letting humanity down in doing so. Many people reading this might not want to hear this, but this does not mean that you do not need to. A general attitude of apathy, rather than introspection, does little to push scientific progress forward.

Inarguably, things have changed in the last 30 years. But the questions of who is controlling the flow of change, what the implications of these changes are, and what the fundamental roles of science in our modern society are, remain poorly understood. Academies and publishers as core economic organisations have not been disrupted beyond slow, incremental, and poorly-managed changes; copyright law remains focused on a print-based

world; research is still governed by academic hiring practices and the ideology that international economic competition and growth is the ultimate goal for much of research. The rich are certainly still getting richer, and the consumption and communication of research knowledge still remains focused on ideas developed more than 2 centuries ago.

Often this phenomenon is termed the 'hegemony' of scholarly communication, meaning that despite the innovation of the Web, and the social motivations behind open science, much of the control remains enclosed by an increasingly concentrated number of powerful key players, such as Elsevier, Clarivate Analytics, and Springer Nature (Larivière et al., 2015). There are several commonalities among these key players which demonstrate that they have little truthful relationship to Open Science:

- They are demographically and geographically homogeneous, being based almost exclusively in 'western' nations;
- Their primary motivation is profit and growth by default;
- Their business models are based on discrimination against the least privileged (status, financially, geographically) (Mak, 2018);
- They are in control of virtually all aspects of the modern research environment; and
- They operate based on a branding system that perverts the research process (Brembs, 2013).

So, how does one truly disrupt this? It is difficult not to be overwhelmed when looking at the scale and scope of scholarly communication players, processes, and power dynamics. It is a complex world out there, and we do not yet fully understand how Open Science can, and will, impact upon our wider world.

That being said, there are several things that could be done here based on collective action, once the global community has established a common set of values and understanding of Open Science.

1. Weakening of the position and power of present negative actors;
2. Strengthening the position and power of those who call for reform;
3. Inclusion of the socio-political, economical, and legal issues within Open Science;
4. Cross-pollination by the global research community across present silos; and
5. Development of a true movement or community surrounding Open Science.

All of these have one ultimate goal, irrespective of how we define Open Science, and that is to build the environment where scholarship becomes a sustainable public and societal good, and not a private commodity.

Additional dimensions of this could include the simple act of communal learning and transparent sharing and accessibility of our collective knowledge; being broadly inclusive of a broad set of regions and traditions; being deeply self-critical and introspective; and providing an incubator to help foster and scale-up ideas and services. These core functions can all be decided on based on as broad community engagement as possible.

Given the enormous implications of this transformation towards 'science for society', the solutions need to be fairly ambitious. What I believe is needed is a body that is at the same time politically and publicly active, educational, and reaches across all nations, to provide the framework for the development of sustained global Open Science. So, something like a federated international (i.e., all nations) Open Science coalition, which is actively progressive in its system-wide implementation of Open Science as a public good. Such a coalition could be based in part on existing international organisations, such as the EU-focussed OpenAIRE. This could really help to establish a stable and global Open Science community, while simultaneously pushing forward on all fronts needed (including funding).

Several nations have already identified themselves as key members of this vision by establishing early Open Science policies (e.g., Serbia, Mexico). However, what is missing is a centralised body that unifies and connects these 'silos', yet remains fully accountable to them. Think of something, for example, like the Electronic Frontier Foundation or Open Source Initiative.

The UN seems like a likely candidate place for such a body to form and coalesce existing supranational initiatives, with the added bonus that it can then be internationally consultative. Elements of this are already beginning to fall into place, such as with the development of the Open Scholarship Initiative, the Foundations for Open Scholarship Strategy Development, the Joint Roadmap for Open Science Tools, OCSDNet, and the Open Science MOOC. These are all just pieces of a larger puzzle, but the unification of them all together under the banner of Open Science as a human good is the ultimate picture.

The ultimate challenge is synergising education, political activism, and policy development in a sustained international way, that is also accepted or supported by the global research community. Open science at its core is about connectivity, and I feel the time has come to embrace this at a new level.

The real question is, who is going to start this?

The "problem" of predatory publishing remains a relatively small one and should not be allowed to defame open access, LSE Impact Blog. Co-written with Tom Olijhoek.

Imagine you want to investigate the quality of restaurants. You know beforehand there are bad restaurants. So, you set up your investigation by going to a number of bad restaurants of bad reputation. What do you find? You find that a number of restaurants are really bad, an inevitable conclusion. You even find that people of standing and reputation have visited these restaurants on occasion.

Would the conclusion here be that all restaurants are bad? Several investigations of this kind have looked into the problem of "predatory" or "questionable" publishers, the most famous being the heavily criticised and deeply flawed "sting operation" by John Bohannon in *Science* magazine. In science speak, this is called doing an experiment without an appropriate control group, usually sufficient for research to be desk rejected for being fundamentally flawed.

The latest such investigation, led by an international group of journalists, revealed something already widely known: in a number of countries, a relatively small number of "fake" papers have been submitted to, and published by, relatively few known-to-be-questionable journals that engage in deceptive publishing practices. The investigation built on this existing knowledge, and found that many of the journals to have accepted these articles had also published authors of name and fame, something which had often been overlooked before. It was said that in Germany, the main example used in the investigation, more than 5,000 researchers had published in such predatory or questionable journals, and the investigation in the UK also yielded the names of 5,000 researchers. A report of the investigation (unfortunately only available to view if you sign up for a two-week trial) showed a figure of geographical distribution of predatory publishers, without any attribution. The figure was taken from a highly-cited article by Cenyu Shen and Bo-Christer Björk that was published in 2015, but without appropriate reference.

The investigators quoted the estimated number of 420,000 articles in predatory journals, also taken from this publication without reference. This figure has been shown to be highly overestimated thanks to meticulous research by Walt Crawford, who, using the same source data, estimated a number closer to the region of 135,000 articles. While this number is by no means small, it is a relative drop in the ocean considering that more than two million articles are published each year in English-language journals alone.

Publications about parts of this investigation are still appearing, and the popular press, including TV and radio, has paid a lot of attention to this international collaboration. In many cases, however, it does not appear that the source data or methods were widely shared with these media outlets, and at present they are not public. Indeed, one journalist involved, when asked for the data supporting this media campaign to be shared, responded that the data could not be shared for legal reasons, despite also stating that the information is otherwise widely available online through web-scraping techniques. It seems strange that journalists

appear not to want any form of independent verification of their work, given this is exactly one of the issues they are challenging within the scientific enterprise.

The investigation and many press releases and media attention suggest a link between predatory publishing and open access publishing, or at least traditional publishing models and research integrity.

It is utterly incomprehensible that scientists accept this kind of investigation as sound. The methods appear opaque and flawed, at least partly plagiarised, the data are inaccessible and unverifiable, and often reported on without independent journalistic scrutiny; all things we expect of any rigorous, research-based investigation, and especially one to gain international media attention of this scale.

The investigation and its coverage also largely fail to note that there are a range of existing efforts to combat this widely known issue. For example, what about the fact that there are at least 12,000 trustworthy open access journals indexed in DOAJ, acting as a "whitelist" to combat the issue of questionable publishers? These journals have published more than 3.3 million research papers to date, and every day researchers are increasingly publishing in a wide array of reputable open access journals.

What about the fact that many predatory journals are subscription journals also? The problem here comes from opaque definitions of what characterises "predatory" publishing practices, across the whole publication ecosystem, and indeed far too much opacity around the entire publishing process and system. We need to view this "problem" in perspective in order to assess its *relative* importance!

This leads one to the question of why this campaign was started in the first place, what its intention was, other than to more widely spread information about something already generally known by the research and publishing communities. In a paper last year, Martin Eve and Ernesto Priego queried who is actually harmed by "predatory publishers". They concluded that real harm is basically negligible to virtually all stakeholder groups, and indeed that "*established publishers have a strong motivation to hype claims of predation as damaging to the scholarly and scientific endeavour while noting that, in fact, systems of peer review are themselves already acknowledged as deeply flawed*". This issue of peer review was also noted in a recent Lambert Heller post, which recommended transparency as the best remedy for any potential harm caused by predatory publishers. This understanding is important, as it comes at a time when radical ecosystem shifts are occurring, such as the recent launch of Plan S in the EU. Given these potentially seismic shifts, we need to make sure our conversations stay focused on the real, larger issues at hand, such as why each year we continue to funnel billions of dollars of public funds into the hands of corporate giants that impose a tax on access to public knowledge and education.

In the meantime, the discreditation of open access is showing effect. Scientists, governments, and journalists claim that predatory publishing is a big problem for scientific communication caused by open access based on the "facts" uncovered by a worldwide investigation. Predatory publishing is, in fact, only a minor nuisance caused by scientists who don't follow simple rules on where to publish. These simple rules are excellently described by Think, Check, Submit, a fantastic tool for researchers who aren't sure about the legitimacy of a journal. In addition, scientists could pre-select safe open access journals by using the DOAJ list of indexed open access journals, currently containing more than 12,000 journals. The problem of questionable publishers is more of an education problem, exacerbated by the fact that journals are still considered the primary communication and reward system for researchers.

The best way to help resolve this would be to include learning programmes on open science and open access as a mandatory part of undergraduate studies and PhD courses. This is something that is being worked on as part of a huge collaborative effort with the Open Science MOOC and other community-led trainings.

With these simple educational measures, the "problem" of predatory publishing would simply fade away, leaving ample choice of good open access journals to publish in. Furthermore, a recent cross-publisher initiative to support the publishing of referee reports could help to expose "predatory" practices almost immediately, as journals who refuse to share information on their peer review practices could be treated with greater suspicion. The only problem remaining will be the ever-rising costs of subscription publishing which will cause more and more countries to continue cancel their subscription packages.

But that is not the problem of publishers who only commit to open access. There are huge changes happening right now in the global scholarly publishing ecosystem. Yes, "predatory" publishing practices are a problem, but this is a relatively small issue compared to the fact that the vast majority of our global research corpus remains a private commodity owned by a small number of multi-billion-dollar corporations. Let us focus our efforts on the bigger problems here, and make sure that we are truly seeing the forest as well as the trees.

Full comments about 'Plan S' and the future of Open Access in Europe.

Today, an article was published in Science Business about some of the developments around Plan S, the European Commission's ambitious new plans for Open Access. The piece includes a quote from me, and I want to share my full responses here for the sake of transparency.

Do you see any weaknesses in the plan? Some researchers are concerned about what the APC cap is going to look like, for instance…

Just to be clear, I think this is one of the stronger funder-based policies in Open Access that has been committed to in recent years, and they should be applauded for that. So, one of the

key weakness for me is again the focus on APC-driven Open Access. This is just one part of a complex ecosystem, such as green OA (or self-archiving) which is free for authors, and would also motivate the improvement and connectivity of existing library/institutional infrastructure and subject repositories. It also seems to ignore the fact that around 12,000 reputable OA journals are fee-free, according to the DOAJ. Missing out these key low-cost options seems to me that Plan S does not pay due consideration to creating an equitable system of Open Access that does not continue to lock out those who are less financially privileged. The EC again needs to be clear on these things to avoid having commercial publishers continue to corrupt OA through high APCs, restrictive licensing/copyright agreements, and embargoes on 'green' OA that are clearly not in the public interest.

Relating to this APC cap, I think that generally this is a good thing as it places some constraints on the market. However, a focus again on APC-driven OA discriminates on independent researchers, or those from less-well funded labs or institutes. The EC here has the opportunity to take a leading stance on how it controls incentives, for both researchers and publishers, through financial flows, and to me it needs to give due consideration here to the strategic expenditure of public funds and the social implications of this. For example, the EC has to make sure that it is spending its money, which it gets from the public, in the interest of the public, and not finding new ways of channelling it for private shareholder gains.

Another potential weakness that we see is the potential for disruption of the infrastructure by commercial players. For example, we see Elsevier and Springer Nature now moving rapidly into the world of scholarly infrastructure, and the EC needs to protect this from the control of commercial entities. For example, by demanding open source, open licensing, and open standards for any developed infrastructure.

Another potential weakness is that it seems to focus quite strongly on science, with only brief consideration to other fields. This is quite an over-simplification, as different research communities have a range of social norms, practices, and cultures, which need to be given appropriate consideration when drafting such holistic policies.

Do you fear Europe may be cutting itself out of top journals? A point raised to me today was that this was a potentially dangerous path for researchers to go on, unless China or the US followed too…

I might have a slightly more er, radical view, than many on this, but I think if Europe can rid itself of the desire to publish in 'top journals', whatever they are, then this is ultimately a good thing. Journal brands are often operated by commercial entities that are more interested in creating a product to sell than advancing scientific discourse. The corrupting effect that journal rank or brand has on science is well-documented, and it is time to move to a more rigorous, equitable, and, well, scientific system of research evaluation. This is why it is great to see the renewed focus on signing awesome initiatives like DORA too, and moving away

from the mis-use of the Journal Impact Factor. This is the sort of high-level progress we have needed on these issues for some time.

However, this does raise the need for the importance of international collaboration on these matters. Why isn't the EU working with China and the US, as well as Latin America and Africa, on these issues? There is the opportunity to coordinate on a global level to make scientific research something that is inherently a public good again, but this does not seem to be happening. I don't see this as dangerous really at all, but indeed a good motivation for us all to work together to cast off the shackles of an inherently broken research evaluation system. It will be up to the funders who signed up for Plan S to go beyond a mere commitment to actually systematically redesigning the research assessment process, and that is not an easy task. What also needs to be given much more consideration is researcher attitudes and behaviour. The EC is not going to win hearts and minds in this arena through policies and mandates, that just isn't how humans work. It needs to pay careful attention to developing and empowering communities that intrinsically understand issues around journal-based evaluation systems, and make sure that best practices on the ground are in line with this.

Is the plan enough to force publishers to change their business models? Or what do you think it will take for that to happen?

So, this is an interesting question. You have to look at the history, and ask why are the business models of publishers so important here? If publishers are service providers, their business models should be dictated by the needs and demands of the research community. However, this often seems to be backwards, and we see instead publishers imposing restrictions on policies and practices through by enforcing constraints based on their own business practices. Sustainability of the publishing sector (including their profits) is a terrible argument to make when it comes at the cost of public access to scientific knowledge. Publishers should be told that they have to adapt, and if they can't, well, tough.

Look at what SciELO did across Latin America and further. Researchers and governments came together to create a low-cost system of almost complete access to scientific knowledge based on the common understanding that access to scientific knowledge is a societal good. In the EU, we still have publishers whose primary job is to make money by denying this – their business model is based on knowledge discrimination after all. I think we all know that it is time for this senseless business model to change, and hopefully Plan S will be part of the change so that we look back in 10 years' time at the chaos Elsevier and co. created we will wonder how we ever let them get away with it for so long.

Why DORA Is More Important Than Ever—a Perspective From an Early-career Scientist, DORA Blog.

As a graduate student, I signed DORA to speak out against the misuse of the impact factor. Even with my career before me, I knew that something about the way research was being evaluated in hiring, promotion, and funding decisions needed to change. It did not make any sense that the value of a researcher is largely based on the journal where their work is published, and yet this was the system that I, and my fellow PhD cohort, felt we were being forced into. I had wanted to be evaluated based on the quality of my research, how it was re-used by my colleagues around the world, and how others shared and discussed it online.

The local community at Imperial College, where I completed my PhD work, contained a vibrant group of forward-thinking individuals, who were constantly engaging with other researchers and the wider community around London about topics to do with Open Science and assessment. Through this group, I realized that I was not alone in my concerns, and that others were working to create a better system around research evaluation. Thanks to the financial support being offered towards Open Access at Imperial, I was in a fairly unique position that allowed me to both fight the present system while also being granted the liberty to play the 'publish or perish' game. I was in a privileged position where I could publish much of my research in high-impact-factor Open Access journals and pay the high fees for Open Access that my colleagues at other institutions were often unable to afford. This model, however, is not easily translated to other institutions, or countries, and still relies on journal-based metrics for controlling where research is published and how it is assessed.

Speaking out is necessary to create a more rigorous, reliable, and equitable system of research evaluation. A few years on, the message seems to be percolating through many levels of the academic ecosystem. As of September 2018, DORA has been signed by more than 12,000 individuals and 500 organisations from around the world, demonstrating a strong collective commitment to a fairer research evaluation process.

DORA is undoubtedly making progress, and is now manifesting into real change in the research ecosystem. Progress may seem slow, but in a system defined by inertia, and accompanied by a complex web of 'stakeholder' interactions and power dynamics, any amount of change is positive. Preliminary results from research conducted by the Scholarly Communications Lab at Simon Fraser University in Vancouver, Canada, shows that the impact factor is only mentioned explicitly in about 20% of review, promotion, and tenure documents in North American research institutes, much less than we might perhaps expect. This is a positive sign that steps towards a more fair, sustainable, and equitable system are being made.

The declaration is a statement of intent, and signatories are not required to be fully compliant before they add their names. Signing is easy, but creating real lasting change in the community is significantly more challenging. However, the recent release of 'Plan S' in Europe could catalyse widespread change.

Plan S has one primary principle: “After 1 January 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,” as well as 10 key sub-principles. This is the sort of disruptive change needed to bring European Open Access publishing in line with other regions like Latin America.

One key aspect here is what Plan S says about incentives and metrics in research evaluation. Importantly, it recommends the support of the 18 recommendations in DORA, which is a strong move from such a powerful collective of funding bodies. In the context of publication choice, Plan S makes the following statement: “*We also understand that researchers may be driven to do so by a misdirected reward system which puts emphasis on the wrong indicators (e.g. journal impact factor). We therefore commit to fundamentally revise the incentive and reward system of science, using the San Francisco Declaration on Research Assessment (DORA) as a starting point*.”

This is a significant announcement, reflecting years of anguish aimed at the impact factor. Now, those behind Plan S have the opportunity to empower the individuals in charge of research assessment and hiring, tenure, and promotion decisions to actively implement DORA principles, and cultivate a real culture of fairer assessment.

Plan S and DORA together provide fertile ground for dispelling the myth that impact factors or journal brands have anything to do with research quality, and the potential ramifications for this go beyond just Europe. A combined approach of bottom-up, grassroots campaigns supported by organisations like DORA, coupled with high-level policy action at the international level is essential. Only then can we break out of the current academic reward system and accommodate a better system of research evaluation.

Open Science: who benefits? Marinazine.

Science affects almost every aspect of the world around us, from the water we drink and the air we breathe, to the houses we live in and the way our body functions.

According to Article 27 of the UN Universal Declaration of Human rights, (1) Everyone has the right freely to participate in the cultural life of the community, to enjoy the arts and to share in scientific advancement and its benefits; and (2) Everyone has the right to the protection of the moral and material interests resulting from any scientific, literary or artistic production of which he is the author.

To enjoy the arts and to share in scientific advancement and its benefits is a fundamental human right. How great is that? Yet, it is being violated every single day.

It might come as a surprise to most people, but virtually all scientific research is locked away behind ridiculously expensive paywalls operated by one of the most ruthless industries in existence. Even today, only around 25% of all published research knowledge is actually accessible to the wider public, and the rest is treated as a private commodity to be traded at the whims of corporate giants like Wiley and Springer Nature.

Not only do these companies therefore operate on a business model of depriving most of the world basic human rights, but they also pervert the entire research process. Every researcher knows the mantra 'publish or perish'. This means that researchers are forced into a system where the journal in which they publish is more important than the value of the research they conduct. Who owns those journals? The same corporate giants who make most of their money by enforcing a system of knowledge discrimination. These commercial entities essentially sell brands, but brands which researchers are forced to chase after as this is what they are evaluated based upon.

The consequence of this is that rigour and reproducibility, fundamental aspects of research, are often side-lined by researchers who are forced to play a game in which providing a narrative and a story that publishers can sell is more important. We now live a research ecosystem around the world which is beset on all sides by poor or questionable research practices, retractions of high-profile papers, proliferation of misinformation (think vaccines and autism) as a result of this system, often redundant or wasteful research, slowly communicated, and a game where only the wealthiest or most elite have a competitive advantage, and others are locked out.

This is not science as usual. All the way back to the origins of scholarship, research was open, it was rigorous, and it adhered to strong principles. However, somewhere along the way, we diverted from this and we made it closed. We broke the system, and the values that we hold so dear in science became corrupted by very different values around branding, marketing, and commercialism.

Open Science is the movement to return science to its origins, based on core values and principles that return the practices of science to its humble and foundational origins. As it based on human rights, one could argue that it is a social justice issue relating to the equitable access and distribution of research and knowledge for the betterment of society. We need to better communicate this aspect, to reach the natural conclusion that we need to more widely adopt the practices that we associate with [open] science in a modern, digital research world.

If we look at the 17 UN Sustainable Development Goals, it is very difficult to find one in which science or research does not have an important role to play. Climate action, clean water and sanitation, quality education – in all of these goals, science has a clear role to play in helping to solve them. Locking science away is not doing the sustainability of this planet, and those who live on it, justice. One would think that this in itself would be a fairly strong case for Open Science, but sadly it seems to need more than this.

Almost all discussions these days around Open Science come down to one core thing: incentives. How do we encourage scientists to share data, to make their code open, to publish in Open Access journals? For me, this is the wrong discussion, and has been for some time now.

Every researcher starts off as an open scientist. Find me one researcher who does not come into the system with a heart full of passion for discovery, who wants to find something new about the world and then share it with all who will listen. This is a common shared value that virtually all of us possess, otherwise why would we be doing the job in the first place? However, this often seems to become ground out of our best and brightest, as they realise that 'publish or perish' is very real, and a game they have to play if they want to eat, support their families, or pay the rent.

So, we need to focus our discussions on these core values, and how do we 'incentivise' them, by creating an environment which allows them to flourish without risk, for us to be creative and to fail, and to reward good scientific principles and practices. Open Science is not really any different to science – it is just science conducted the way it was meant to be, and for the betterment of society and our world. Everyone benefits from a culture of sharing, freedom, equity, collaboration, and it is up to researchers themselves to take control of the system they live in and make this culture the new norm.

Dr. Jon Tennant on an Introduction to Open Peer Review Process, EURODOC.

Peer review is one of the main pillars of modern science. It is part of the critical process that decides what knowledge enters the scholarly record, and ultimately the collective knowledge of mankind. It also decides the fate and the future of researchers, as publishing of peer reviewed research articles is often crucial for career advancement.

However, what is becoming increasingly clear is that often the common ideal of peer review as a method of filtering out 'bad' research is distinct from its actual implementation. Peer review has often been heavily criticised as a result of this, for unreliability and inconsistency, often causing unnecessary delays to communicating research, being expensive to manage and biased, often without accountability, and often also being wasteful in that much of the valuable discussion within is typically lost. Furthermore, it is often criticised for failing to stop 'bad' research from being published, and the proliferation of scientific misinformation.

Now, these are not systemic issues across the entire publishing system by any means. However, enough evidence exists to suggest that these problems pervade peer review differently across journals, communities, and depending on the management of the process. So, what is being done to help resolve some of these issues?

Open Peer Review Takes Many Forms

Open Peer Review (OPR) is part of an ongoing transformation happening in the world of science and scholarly publishing, more widely known as Open Science or Open Scholarship or Open Research. However, OPR is not a simple concept to understand, and often it is used to reflect a myriad of different aspects of the evolving peer review process.

In a systematic review of 'Open Peer Review', it was found that 122 different definitions existed! From this complexity, it was possible to distil 7 core traits that define OPR:

1. **Open identities**, where authors and reviewers are reciprocally identified
2. **Open reports**, where the review reports themselves are published
3. **Open participation**, where the wider community can contribute to the process
4. **Open interaction**, where review takes the form of a discussion
5. **Open pre-review manuscripts**, where manuscripts are available prior to any formal review process
6. **Open final-version commenting**, where the final published manuscript can be reviewed further
7. **Open platforms**, where reviews are facilitated by a service external to the journal itself

What this means is that when we are discussing OPR, we have to be very clear about which aspect we are talking about to make sure that we are all having the same discussion!

It is worth being aware that things are also changing very rapidly with OPR. For example, recently Jessica Polka and ASAPbio launched an open letter, now signed by 100s of journals, calling for the widespread publication of peer review reports as a way of injecting transparency into the process. There are now dozens of tools, platforms, and services that exist around journals and peer review to help improve the process in a variety of ways.

Open Peer Review is Not a Solution to All Our Problems

Now, OPR is not some magic bullet that is going to solve all issues within the overall system of peer review overnight. For example, there is little informed consensus on the impact of double-blind reviews (reciprocal concealment of identities) versus fully revealed identities, and often the limited available evidence is conflicting or overlapping.

One problem with this is that getting data on the functionality of peer review, and the differential impact that it has across communities, is often very difficult. This is because, historically, it has been a closed and secretive process, which actually makes any sort of detailed or systemic understanding of peer review very difficult.

The Future of (Open) Peer Review

The hope is that with increased transparency in the peer review process, we can gain a greater understanding of how it works (or does not work well), and use this to improve and streamline processes across journals and communities, with bespoke solutions as needed. At the moment, accountability within the present mostly closed system is almost completely absent, and we should all be seeking ways to improve that, based on the technologies and systems that we have readily available to us now.

We also need to stop perpetuating the fallacy that peer review is some magical process that differentiates scholarly research in 'true' and 'false', as this creates all sorts of issues further down the line with the media and wider public engagement with science. What is clear is that there is no single unified process of 'peer review', and it is a diverse, inherently subjective, and well, human activity. Openness is a way of injecting some much-needed experimentation into the process in the hope that it can be improved for those engaged in peer review, as well as the wider society who benefits from the use of peer reviewed research.

As scholars, we should not be afraid to innovate around peer review, but let us make sure that when we do, it is based on an honest and transparent evaluation of present processes. And we cannot have this without exposing the closed, black box of peer review.

The latest in the Elsevier and Open Science Monitor saga.

For those of you who have been following, there has been a lot of controversy about the role of Elsevier in the European Commission's Open Science Monitor. Recently, the European Commission responded, and I was interviewed for ResearchResearch about this.

My full, unedited comments are here for transparency:

So yeah, the EC have finally responded! You can see the letter here, which many are already annotating pointing out weakness, missing information, contradictions, where questions were not answered etc. This is such a welcome response from them though, and clearly indicates that the community had raised legitimate concerns about Elsevier and the procurement process. However, it should not have to take a letter with 1100 signatories to expose this sort of information, and it should have been readily available. I'm very happy that the EC decided to treat this seriously, especially after both Elsevier and the President of the Lisbon Council offered absolutely pathetic responses (see the history here). So, the EC's response is a welcome, informed, professional response, unlike that of the previous two. I don't know yet if we will approach the Ombudsman. Clearly there are still some questions that need answering, but we need time to digest this information properly and formulate a response.

Our complaint came in two main parts – about the procurement process, and the role of Elsevier and the inherent COIs. I'm pretty happy with their response to the first part, and we

anticipated this. Like I said though, there should have been substantial more transparency in the first place. Some elements about the timing of the announcements, the precise role of Elsevier, the accountability of the EC, and a couple more bits, but nothing too major. However, the second part about the role of Elsevier and the overwhelming bias towards services/metrics they own was not resolved in the slightest. The EC stated "*The consortium is neither fully dependent on Elsevier, nor does Elsevier determine which indicators the Monitor bases itself on*." Which, from what we can see, is nonsense. Virtually all indicators are owned by Elsevier, and there are something like 300 comments now on the indicators, many which call out this bias and the inherent COI for Elsevier. The actual role of Elsevier in defining these metrics (or not) is not in any public document, so we are basically being asked to trust that Elsevier did not play any role in defining metrics/services/tools that are pretty much only operated by Elsevier. Yeah, no, that's not how you generate trust. Also, as of today, those 300 comments have not been addressed publicly, and we know that the Lisbon Council held an exclusive meeting about the Open Science Monitor, but no information at all about that has been disclosed either. There is far too much secrecy surrounding this, and it is too important a topic for that. Much of what the EC state in their report about this does not address this issue in the slightest either (see annotations, point 17). It also seems incredible to me that they state "there is no conflict of interests or distortion of fair competition. The Commission does not assess the potential benefits of a subcontractor to a consortium", which seems to imply that the EC also does not assess the potential conflicts of interest or distortion of fair competition of subcontractors to a consortium. Which is bonkers, because if they don't who is? And with such a blatant COI here, this seems far too casually dismissive. Oh yes, the fact that the data for the OSM will still not be open, made using open source software, or using open licenses and standards, is still pretty hypocritical too.

As well as this, it is still ridiculously ironic, and also generally offensive, that Elsevier have this role. Historically, they fought against openness, and the movement was virtually started to combat their practices. It just simply cannot be allowed that they maintain this position. Again, it's like having McDonald's advising and providing information on dietary habits and healthy eating.

Much of this is also part of the bigger problem that commercial organisations are gaining too much control over infrastructure that is critical to the future of open science, as well as bewilderingly having substantial political leverage, which clearly is not in the public interest. More on this here and here recently with Google and Knowledge Unlatched. Oh yes, there are also now two European Open Science Monitors. Have fun with that one.

This complaint was something of a warm up, to test the PR machine of Elsevier and the EC. Elsevier failed miserably, and now we know their tactics – attempt to discredit their opposition, without providing any intellectual debate over issues raised. They exposed how badly they handle rigorous criticisms and community-driven initiatives like the complaint, which we can use as leverage now in the future. Which is great, because I can tell you for the

FIRST TIME (#exclusive) that we have now prepared a full report to the EC Competition Authority detailing how Elsevier abuses its market position, and that indeed the entire scholarly publishing market is dysfunctional and requires intervention or regulation from the EC. I aim to share that report online in the next few days, travel pending. This follows a report in 2002 from the UK showing that the market was not working too well, and would require action if it got worse. 16 years on, it clearly has in a number of ways, and we want to fix that. I can tell you more about that when it's out though.

So, ultimately, it's a mixed bag. The EC should be applauded for crafting such a detailed response, also simply as a matter of respect. The Lisbon Council and Elsevier should be similarly ashamed of their behaviour regarding this matter, and be reprimanded for it. Some questions were answered, others were not, other statements are clearly a bit misleading or trying to avoid the real answer (i.e., being political). The crux of Elsevier's involvement though still has not been addressed, so follow ups are needed. But it is a lot of effort to do these things, and I don't know what they might achieve. So, we have to keep trying. No one wants Elsevier in this position, they have not earned it, it is corrupt, it is a cruel irony, and we need to keep standing against them.

The cost of knowledge: Education unions unite against the privatisation of scholarly research by Jon Tennant, NORRAG.

Major shifts are on the horizon in the world of scholarly publishing. Governments, researchers and research libraries have begun to push back against the private ownership by publishers of mostly publicly-funded research, as well as against the exorbitant cost of scientific journals and books. For example, the recent unveiling of Plan S has generated a substantial amount of debate around Open Access and has potentially far-reaching consequences across the entire research ecosystem. Concurrently, the European Union has declared that all research should be open access by 2020. Refusal to accept bundled subscriptions to journals for research libraries is mounting.

Although it is counter-intuitive that the knowledge generated from publicly-funded or individually-funded research could then become privately owned and managed for profit, this is currently often the case. The 'publish-or-perish' culture of academia means that only a small minority of scholars can avoid being locked into the system whereby they typically give up copyright over their work in exchange for publication in privately owned peer-reviewed journals; where often journal brand or impact factor has more value than the intrinsic merit of the research itself.

The UN Sustainable Development Goals include critical issues such as energy, food, and water security, combating climate change, providing equal access to education, and preserving the world's biodiversity – all things in which availability of scientific research is vital. It is

particularly harmful for researchers working in poor countries where universities and their libraries are dramatically under-resourced overall to be limited in access to this research.

Against this background, Education International commissioned this author to provide an overview of one of the dominant publishers in this space, Elsevier.

The report on Elsevier describes an unusual, but not unique, situation. Elsevier derives around three quarters of its revenues from public funds and generates an annual net profit of 37%, unmatched in other legitimate businesses. It relies on copyrighting knowledge that has been produced mainly or exclusively with public funding, locking such information behind staggeringly high paywalls even by rich country standards. It bundles up the knowledge in a delivery system that contains a take-it-or-leave-it package that cannot be completely tailored to individual library needs. This bundling system, often called the 'big deal' has facilitated the spectacular price increases for Elsevier journals since its instigation around 1996, and led to a phenomenon known as the 'serials crisis'.

The business model of Elsevier and other publishers of research is based on ownership and sale of knowledge produced without their investment and honed by an army of academics for vetting (peer review) and editing, typically as volunteers. This model is exclusionary against all those but the wealthiest institutions or researchers. At the present, the current cost of maintaining limited access to a minority of people on this planet is around €10 billion euros a year. Historically there appears to have been a lack of cohesive, strategic co-ordination to challenge commercial publishers in this space.

The dependency of academics on academic journals has locked English-speaking academia into a system in which publishers can pretty much dictate their terms to both producers (scholars) and disseminators (university libraries) of knowledge. Between 1986 and 2015, costs of resourcing US research libraries (including journal subscriptions) have risen at five times the rate of the US Consumer Price Index.

However difficult the situation with production, access, and ownership of research is in wealthy countries, it is exponentially bigger in poor countries. Authors there are often reduced to using research that is available because it is older, or to using non-peer reviewed material that may or may not be authoritative, contributing to a vicious cycle of less publications and less recognition.

The involvement of EI at this time could not be better. At the present, Elsevier and others are becoming increasingly powerful in undermining open policies, while simultaneously commercialising many critical components of scholarly research infrastructures. As opposed to just controlling researchers through publishing practices, they are now moving into governing the entire research process, where individuals will become their service provider, product, and consumer all in one.

Now, Elsevier is clearly not alone in this space. Others like Springer Nature, Wiley, and Taylor and Francis operate in very similar ways. Elsevier, in particular, has a history of vigorously fighting against progress in the global Open Science movement campaigning in the US for example, to equate Open Access with government censorship and promoting its subscription model as the only way to maintain research integrity

Elsevier is extending its control over the wider research ecosystem beyond publishing. Its acquisition of key services such as Mendeley (reference management), Pure (research information management), and SSRN (early stage open access publication), highlights this. Beyond journal brand/rank/impact factor, researchers now risk becoming locked into a research system in which they are dependent on Elsevier's vertically-integrated services.

Many unfavourable side effects of the 'publish or perish' culture are also favoured by the Elsevier business model: incentivizing novelty and media-grabbing research results, pushing academics into providing services for free, extracting financial contributions for open access, intimidating academics and researchers who insist on sharing their work in spite of non-disclosure agreements and copyright. 17,000 individual researchers are now boycotting Elsevier in protest of these practices.

Perhaps more significantly, national consortia of higher education institutes are for the first time exercising collective negotiation strength against Elsevier and other big publishers to push back. Historically, individual research institutes have had to independently negotiate with Elsevier and other publishers about which journals they have access to. Negotiation teams representing large institutional consortia, especially in Germany and Sweden, are refusing to re-subscribe to Elsevier's products, due to a combination of their high prices and other negative business practices.

This represents for the first time a potentially major shift in power dynamics in this space, and helps to reduce the drain effect that Elsevier has had on research libraries for far too long. Others around the world are watching with interest to see how these new moves play out, with the potential for an enormous transformation of the entire scholarly publishing ecosystem.

Education International's role can be to mobilize education unions to become involved within this changing landscape. For example, through direct support of these negotiation consortia by activating academic communities to join in and help make their voices heard. Unions are uniquely placed to challenge the democratic deficit and lack of transparency in Elsevier's business practices, to fight for greater academic rights over intellectual property and copyright, combat the ongoing diversion of public funds into private shareholder pockets, and provide the support needed for a global shift towards a more fair and equitable global scholarly research ecosystem that priorities people over profits.

2019

What is open science and why is it important? AuthorAID.

Science around the world is not working as it should be. Most people on this planet do not have access to all the research that they need, the process of publishing and communication is often slow and wasteful, with much of the research process itself often being redundant and littered with questionable research practices and widespread reproducibility failures. Dissemination of knowledge is often driven by commercial interests, which uses copyright to prevent public access to research, while simultaneously contributing to a system of journal-based research evaluation that many have raised serious questions about.

This comes at a time when our planet is facing major issues to do with climate change, catastrophic biodiversity loss, poverty, access to quality education, and energy, food, and water supply challenges. It also comes at a time when public trust in science is becoming more and more questioned. If you believe that public access to high quality scientific knowledge can play any role in helping us to solve these problems, you must also believe that the closed way that many of us perform and communicate science actively prohibits us from meeting these goals.

Enter Open Science. Open Science has many different meanings and interpretations depending on who you ask. For many, it is a process or a set of tools/services; for others it is a business model or political campaign. For me (and others), it is a set of foundational values and principles that enable a better scientific practice - reducing publication bias, increasing reliability and reproducibility, and making research more sustainable and trustworthy – this ultimately helps make science work better to address the major challenges current society faces. This includes, for example, human-facing values such as equity and freedom, with practical principles such as rigour and transparency in research. These are inherent to most researchers, and therefore 'openness' should be a fairly natural state for most modern research – open science is just good science!

The different types of Open Science as taught by the Open Science MOOC (see also the FOSTER EU Open Science Taxonomy).

Open practices are inherently good for you, your career, and your research. You can accrue citations faster, get greater exposure for your work, increase your speed of communication and collaboration, and even now get more funding and career opportunities. At the same time, the public gets access to your work and your findings can be more widely applied and re-used as the playing field has been levelled. So, in reality 'Open Science' as a set of practices helps to enhance your researcher profile, increases the dissemination of your work, and makes you a more effective researcher, while at the same time emphasising your core values as both a researcher and a human being. Thus, even within traditional systems of researcher evaluation and career progression, openness gives you an edge.

If this sounds too good to be true, it's probably because much of this is still quite idealistic. There are a range of barriers to these things, all of which prevent 'open' become the default state for research. These include financial, awareness, training and education, and evaluation issues, all of which vary enormously across different research disciplines and demographics. To overcome many of the social and technical barriers often associated with openness, we need to have a system of sustained education, training and support for researchers around

the world. Through this, we can empower the next generation of researchers to become leaders in their fields, reduce power dynamics and exploitation, and build a global community based on shared values and collaboration.

Introducing the Open Science MOOC

This is what we are trying to help build through the Open Science MOOC, and with support from partners such as AuthorAID. We want to develop a peer-to-peer, value-based community that works towards better science for society. Our ultimate goal is to help make 'open' the default setting for all global research, through creating and connecting a welcoming and supporting community, based around good tools, teachers, and role models, fundamentally built upon a solid values-based foundation of freedom and equitable access to research.

In late 2018, we launched our pilot module on Open Source and Open Research Software, using the open source platform Eliademy. At the time of writing this, already more than 300 participants have enrolled in the module, dozens have completed the practical tasks, and we have already handed out the first certificates of completion.

Example completion certificate from the first available Open Science MOOC module.

At the present, we have developed everything as openly as possible. All content has been created collaboratively and in the open using our open GitHub project, and all core

communications through our open Slack channel. All content we create is licensed either CC0 or CC-BY for maximum re-use, and constantly released as it is built. The course itself is self-paced, so that anyone can join and complete it whenever they like. And of course, it is totally free to everyone.

In the near future, we expect to launch our next module on Open Principles, and are just putting the finishing touches on the material there. We are also working on growing the community, and hope to start getting the modules integrated with formal training programs at research institutes around the world. As part of this, we are also developing translated versions of the material to make it as accessible as possible, especially for non-native English-speaking people. The whole point of this project is to be as open and accessible as possible to everyone, while encouraging the growth of the open community around the world through peer-to-peer training and learning, and ultimately help to set the default to open!

European Parliament Petition on Elsevier and the Open Science Monitor.

As regular readers here might know, me and Elsevier are not the greatest friends. Last year saw a lot of activism against them, and other scholarly publishers, as a great threat to democratic access to knowledge and the future of [open] science. One of the major points of tension was around Elsevier and their role in the EU's Open Science Monitor. This led to a rather interesting sequence of events:

Summary timeline

1. I wrote an opinion piece in The Guardian expressing concerns with having Elsevier as the sole subcontractor for the European Commission Open Science Monitor. Fox, meet hen-house.
2. A response by Elsevier on their website, which has also received some comments and annotations.
3. Point-by-point reply to Elsevier's response here.
4. Overview of the discussion to that date by the news outlet Research Professional, including comments from an EC spokesperson.
5. Formal complaint filed with the EU Ombudsman accompanied by 432 signatories (but now with more than 1100).
6. Press release issued by The Lisbon Council, responding to the original Guardian article.
7. Point-by-point response to the Lisbon Council's response by me, condemning the tone and content of the two responses.

8. The European Commission responded to our complaint, addressing a number of our original concerns; this response document now being annotated here.

9. I have requested the original contract, which the EC have informed me is being delayed for unknown reasons.

While all of this was happening, I also filed a formal complaint with Björn Brembs to the EU antitrust authority about Elsevier and abuse of a dominant market position, as well as general problems within the 'market' sector. And while all this was kicking off, we released a report with Education International, entitled "Democratising Knowledge: a report on the scholarly publisher, Elsevier". This basically contains everything you ever wanted to know about Elsevier. It also helps to answer the question of why they get so often singled out among all other commercial publishers. The results of both of these things are still in development.

The latest step

Now, as if this wasn't enough, while all of this was happening I filed a request for a **formal petition to the European Parliament** about Elsevier and the Open Science Monitor. I'm happy to announce that they *finally* have processed it and released it online! They provide the following summary:

"*The petitioner denounces the award to a subcontractor to monitor the future progress of Open Science in Europe, as well as the fact that the opportunity to raise a formal appeal was denied to him and others, due to the late notification of the award. He claims that the process of the subcontract award will have a detrimental impact on the future of Open Science and innovation in Europe, the livelihoods of European citizens, and the legitimacy of the European Commission as an institution. He denounces the lack of sufficient care and transparency with*

the process of the contracting procedure. Second, and as a consequence of this, there would be a clear conflict of interest (COI) as the subcontractor would be monitoring and evaluating the very same science communication that they, and their competitors, sell as their primary products."

This petition is the result of a number of things. First, the complaint to the Ombudsman might not be successful (which seems to be the case at the moment). Second, it might not effectively communicate the voice of the scientists who signed, including those who did after submission. Third, this is required for the times in which citizens are frustrated with Elsevier, but have no formal route to communicate that. And finally, we were denied the opportunity to submit a formal appeal about Elsevier's role here. The window for this was only 2 months, and the time gap between the award decision and the announcement of Elsevier as subcontractor was 2 months and 1 day.

Join us!

Nearly 100 have already signed, but **it would obviously be great if this could go viral within the academic community**. Hint hint. Some folks have also said that the website is a bit clunky, which I apologise for. I have messaged the Secretariat about too (as well as the seemingly broken PDF link). All the content you need is on the web page linked to above. I hope you join us and help to combat the threat that Elsevier poses on the future of science. If the European Parliament can get involved, we can actually make big changes! But to get there, first it is up to us.

Elsevier, antitrust, and copyright law – what you need to know.

Following the latest update on Elsevier this morning, I just want to draw your attention to another cool post. This one is called **Keeping Up With… Antitrust and Competition Law**, by the Association of College and Research Libraries (ACRL), who are part of the American Library Association.

It provides a really useful overview of the complaint that Björn Brembs and I submitted to the EU antitrust authority. This was all about how Elsevier and other publishers have created a really weird 'market' around scientific publishing. It also describes some of the potential ways these could be resolved. Our original complaint might be a bit long and complicated, and this post does a really good job of breaking down and highlighting the most salient points. Thank you to Ana Enriquez, Scholarly Communications Outreach Librarian at the Penn State University Libraries, for writing this – much appreciated!

A little excerpt:

Possible Interventions

The complaint concludes by suggesting possible interventions the competition authority could make. Among other things, it suggests oversight of the market by an independent regulatory body, prohibition of non-disclosure clauses in vendor contracts, banning certain flawed measures of publication impact from hiring, funding, and tenure decisions, and strengthening library consortia. They even suggest "abolishing copyright on journal articles."

While some of the suggested interventions could not be implemented by private parties, there are two that libraries and library consortia could take up: strengthening consortia and rejecting non-disclosure clauses. Together with the rest of the higher education community, libraries are also well-poised to reduce the use of flawed measures of publication impact and to examine critically the role that copyright plays in this market.

Elsevier and the Open Science Monitor: Where are we at?

For some time now, many of us having been deeply unimpressed with the fact that Elsevier, one of the chief opponents to the progress of Open Science, will be helping to monitor the future of Open Science in Europe. Metaphors about foxes and hen-houses have been flying everywhere.

We have launched several initiatives to try and combat this.

Approaching the European Commission and EU Ombudsman

One of these was a formal complaint to the EU Ombudsman and the European Commission. Herein, we outlined 2 major groups of issues. The first was more around the awarding process to Elsevier and their group itself, and some elements which we believed required more transparency. The second was around the role of Elsevier, issues with the proposed methods, and the enormous conflicts of interest apparent in having Elsevier monitoring services and processes that they and their competitors sold.

Following this, there were a flurry of exchanges, the most important one being that the EU Commission produced a detailed report to respond to our questions. While this clarified many of the issues, mostly regarding the award process itself, it did not adequately address a number of others; primarily regarding the bias and conflicts of interest around Elsevier and the proposed methodologies.

Our latest step here was to obtain a copy of the awarding contract, which we have now made public (with permission). The original tender is still online here. It seems that pretty much everything checks out here from the EC, as we should have expected. We really appreciate the efforts of the Commission here in providing detailed responses and more transparency to our queries; especially after the callous dismissals by Elsevier and the Lisbon Council that we received when we originally raised these issues. It seems that our concerns were extremely

well founded, as justified by the fact that the EC had to perform a full investigation into the process. No apology from either Elsevier or the Lisbon Council for their ad hominem retorts has been given since.

Petitioning the European Parliament

More than 1100 people signed our original complaint to the EU Ombudsman. However, as this was just drafted as a Google Doc, they weren't 'formal' signatories. As such, one additional step taken was to launch a petition through the EU to request that Elsevier be removed as the sole contractor for the Open Science Monitor. It took a while to get processed, but this finally went live **here** recently.

At the time of writing this, it has 178 signatories. Sadly, a number of people have informed me that the process for signing is clunky and very off-putting. For this, I apologise, and have notified the Secretariat, but there is little I can do besides that.

What is next then?

Well, this is where things get a little vague. The Commission don't seem to care about Elsevier, and their continuous exploitation of the public purse and research enterprise. They seem to not be fully conscious of the conflicts of interest inherent in having Elsevier in a position in which they will so clearly benefit from. They also do not seem to appreciate the fairly offensive irony in having Elsevier monitoring a system that was essentially catalysed by their regressive business practices.

Regarding the Monitor itself, this still seems like it is going to be largely based on biased, proprietary data and systems. These limitations serve to make it virtually functionally useless, in my personal view. Indeed, I fail to see any real advantage in 'monitoring' open science in the first place; especially in favour of grassroots, community-led initiatives towards increasing openness. We don't need more metrics and measurements; we need smarter thinking. The monitor largely fails to achieve this, in its present state. It also fails to uphold the basic spirit and principles of open science, another bitter irony here.

The updated methodology for the Monitor does not exactly inspire confidence either. Many of the concerns about Elsevier raised here and through the open consultation, such as the biased data sources and inherently 'closed' nature of the process, were simply dismissed out of hand. However, one bonus is that there seems to be an expert advisory group now in place, comprising a number of excellent and rational voices in this space. My hope is that the Monitor team listen carefully to what they have to say, especially regarding the limitations of the entire venture.

Besides that, the only thing we have left here is the petition. We can hope that, if a significant number of people sign it, those at the EC realise that the issues with Elsevier here deserve

much more attention. So, I encourage you to **sign** if you have not already, and also to help share it as widely as possible.

If this is unsuccessful, then Elsevier will remain in a position where they are helping to monitor open science in Europe. For an organisation that has invested tens of billions of dollars in preventing public access to knowledge, lobbying against open access, designing proprietary systems, and continues to be one of the biggest threats to democratic access to knowledge, to now be engaged in monitoring open science, is an unthinkable irony.

We can do better.

Imagine a Research Future Defined by Open Values: Introducing the Open Science MOOC, *Generation R.*

The world of research is not working as well as it could be. On all sides we see issues with reproducibility, questionable research practices, barriers and walls, wasteful research, and flawed incentive and reward systems. If we want research to be more effective in helping to solve the problems our world currently faces, we have to be better.

This is what we are trying to help with through the Open Science MOOC. We understand that expectations are changing in how to perform and communicate research, as it adapts to a new age of Web-based technologies. Modern research now demands transparency, collaboration, and a more continuous process. At the Open Science MOOC, we want to help develop a peer-to-peer, value-based community that works towards better science for society.

Our vision of the future and ultimate goal? To help make 'Open' the default setting for all global research. We aim to achieve this through creating, connecting, and fostering a welcoming and supporting community; a community based around good tools, teachers, and role models. Most importantly, a community that is fundamentally built upon a solid values-based foundation of freedom and equitable access to research.

In late 2018, we launched our pilot module on Open Source and Open Research Software, using the open source platform Eliademy. At the time of writing this, already more than 400 participants have enrolled in the module, dozens have completed the practical tasks, and we have already handed out the first certificates of completion. One major goal we had here was to expose the 'human element' behind open source software, and made this introductory video to help with that: Module 5: Open Research Software and Open Source

Our community is based around learning, sharing, and collaboration. It is based around empowering researchers with knowledge and skills to save time and effort, solve research problems, and advance global research as a collective. At the present, we have developed

everything as openly as possible. All content has been created collaboratively and in the open using our open GitHub project, and all core communications through our open Slack channel. All content we create is licensed either CC0 or CC-BY for maximum re-use, and is constantly released as it is built. The course itself is self-paced, so that anyone can join and complete it whenever they like. And of course, it is totally free to everyone. We aim to be as open and accessible as possible.

In the near future, we expect to launch our next module on Open Principles, and are just putting the finishing touches on the content there. We hope that you can join us, and become part of our wonderful community. The future is open, and we want you to be part of it!

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Teaching scientists how to share code, OpenSource.com.

Would it surprise you to learn that most of the world's scholarly research is not owned by the people who funded it or who created it? Rather it's owned by private corporations and locked up in proprietary systems, leading to problems around sharing, reuse, and reproducibility.

The open science movement is challenging this system, aiming to give researchers control, ownership, and freedom over their work. The Open Science MOOC (massively open online community) is a mission-driven project launched in 2018 to kick-start an open scientific revolution and foster more partnerships between open source software and open science.

The Open Science MOOC is a peer-to-peer community of practice, based around sharing knowledge and ideas, learning new skills, and using these things to develop as individuals so research communities can grow as part of a wider cultural shift towards openness.

The curriculum

The Open Science MOOC is divided into 10 core modules, from the principles of open science to becoming an open science advocate.

The first module, Open Research Software and Open Source, was released in late 2018. It includes three main tasks, all designed to help make research workflows more efficient and more open for collaboration:

1. Setting up your first GitHub project

GitHub is a powerful project management tool, both for coders and non-coders. This task teaches how to create a community around the platform, select an appropriate license, and write good documentation (including README files, contributing guidelines, and codes of conduct) to foster open collaboration and a welcoming community.

2. Indexing your project in Zenodo

Zenodo is an open science platform that seamlessly integrates with GitHub to help make projects more permanent, reusable, and citable. This task explains how webhooks between Zenodo and GitHub allow new versions of projects to become permanently archived as they progress. This is critical for helping researchers get a DOI for their work so they can receive full credit for all aspects of a project. As citations are still a primary form of "academic capital," this is essential for researchers.

3. Integrating Git into an RStudio workflow

This task is about giving research a mega-boost through greater collaborative efficiency and reproducibility. Git enables version control in all forms of text-based content, including data analysis and writing papers. Each time you save your work during the development process, Git saves time-stamped copies. This saves the hassle of trying to "roll back" projects if you delete a file or text by mistake, and eliminates horrific file-naming conventions. (For example, does *FINAL_Revised_2.2_supervisor_edits_ver1.7_scream.txt* look familiar?) Getting Git to interface with RStudio is the painful part, but this task goes through it, step by step, to ease the stress.

The third task also gives students the ability to interact directly with the MOOC by submitting pull requests to demonstrate their skills. This also adds their name to an online list of open source champions (aka "open sourcerers").

The MOOC's inherently interactive style is much more valuable than listening to someone talk at you, either on or off screen, like with many traditional online courses or educational programs. Each task is backed up by expert-gathered knowledge, so students get a rigorous, dual-learning experience.

Empowering researchers

The Open Science MOOC strives to be as open as possible—this means we walk the walk and talk the talk. We are built upon a solid values-based foundation of freedom and equitable access to research. We see this route towards widespread adoption of best scientific practices as an essential part of the research process.

Everything we produce is openly developed and openly licensed for maximum engagement, sharing, and reuse. An open source workflow underpins our development. All of this happens openly around channels such as Slack and GitHub and helps to make the community much more coherent.

If we can instil the value of open source into modern research, this would empower current and future generations of researchers to think more about fundamental freedoms around knowledge production. We think that is something worth working towards as a community.

The Open Science MOOC combines the best elements of the open education, open science, and open source worlds. If you're ready to join, sign up for the full course, which is, of course, free.

Embracing Failure as an Intrinsic Part of Science #Failtales, *Digital Science.*

One of the most powerful things I have learned in the last few years is that failure is totally okay. Failure is normal and natural. And I mean this in all walks of life – it is okay to be wrong. It is okay to make mistakes. As long as we use them to better ourselves and grow as humans. We all fail at one point or another in our lives – the difference is how we use those failures.

The same is true for science. Science is not progressed just by standing on the shoulders of giants – it also relies on understanding that those shoulders are propped up by failure as much as they are by success. Failed experiments, failed analyses, failed hypotheses. All of these things characterise authentic science.

But we have a problem. As a culture, we have created a myth that status can only be granted based on success, usually based around the discovery of cool or interesting 'positive' results. At the same time, we say that failure is unacceptable based on the way in which we selectively communicate science. We can do better.

Cherry picking results

Science rarely has its "eureka!" moments. The modern reality is more like "Yes, finally, I got the results I need in order to get published." What we seldom see is, as we say in England, the making of the sausage. Most of research is a continuous process, a messy melange. The

problem is very often, this process goes uncommunicated, secretly stowed away and never to be seen. By and large, we only ever select 'positive' results to be communicated.

However, very rarely is this process reflected in the way in which we distribute 'prestige' and the way in which we reward science. Because of the primary focus on results, this creates the incentive for results selectivity. This is often incorrectly communicated as the need for some form of gatekeeping in order to maintain the 'quality' of the published record. But in reality, what it creates is a distortion in the published research record.

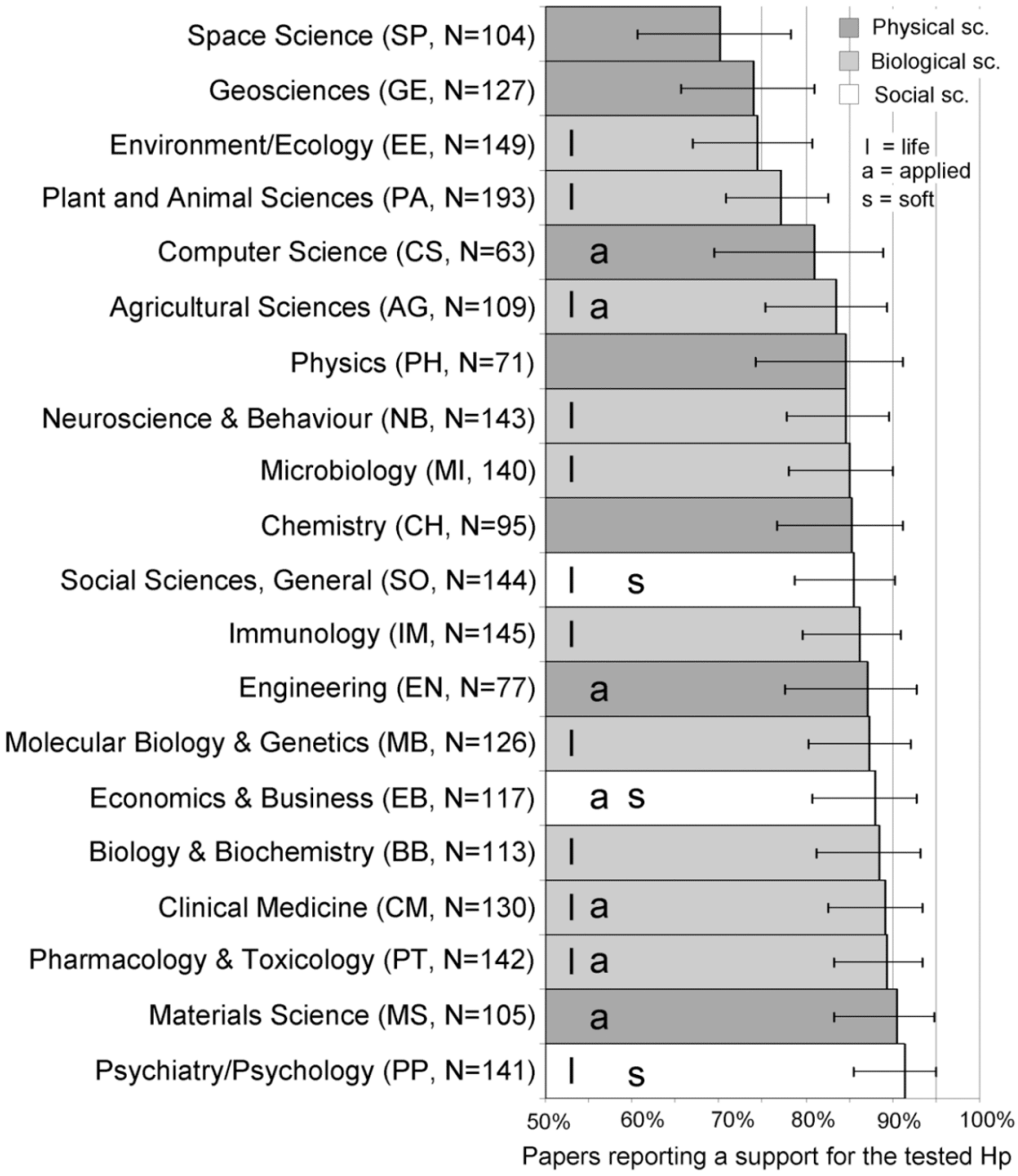
There have been countless pages written about such publication bias. This amounts from what is deemed 'publishable' by researchers, funders, and publishers. Sadly, what we know is that what is deemed publishable (or even sellable) is often quite divergent from the true and full results of research. For example, 'negative' results are often viewed as unpublishable. Or only results that are perceived to be novel, 'sexy', or 'successful' are often considered publishable.

But this is exceptionally dangerous. What we have curated as a research community is an artificial record that only advertises the best, successful, elements of science. All of the failure is kept on hard drives, desk draws, or in our minds.

Imagine what impact that has on research duplication. There are people running analyses and experiments right now which others will have undoubtedly done before, but just not communicated their results. People will be writing grant applications to do research that has already been conducted but remains only known by one group because the results were not deemed publishable.

"*…we have an incredibly skewed publication record that systematically rejects 'failure', or 'negative results*'".

We can see just how prevalent this issue is too. The image below is from a study by Daniele Fanelli in 2010. What it reveals is just how prevalent the selective publication of 'positive' results is across research disciplines. You don't have to be an expert to see that this is pretty much the exact opposite of what it should look like if the published recorded reflected reality. It's prevalence across research disciplines, albeit to different degrees, suggests that something systemic is affecting the way in which we publish results. It is showing that we have an incredibly skewed publication record that systematically rejects 'failure', or 'negative results'.



What even are 'negative' results?

Negative results appear to have a strange double meaning. The first is around obtaining results that do not 'positively' support a tested hypothesis (or reject the null hypothesis). The second is about obtaining results that are deemed subjectively negative, as in cannot be published for one reason or another. For example, not fitting a research narrative.

Both of these framings can be very harmful to advancing knowledge. By framing results as positive or negative, we impose a value judgement on them. This leads to selective communication of those results, as see above. Results are results, and all should be

communicated. Finding no support for a hypothesis still tells us something about the world, and we do the entire scientific enterprise a disservice when we sweep these under the rug.

What does this have to do with Open Science?

Open Science means a lot of different things depending on who you ask. Usually though, it comes down to two core things. First is helping to make the results of research more accessible, typically by removing financial or re-use barriers. The second is more about being more transparent in the research process itself.

Typically then, Open Science manifests itself in practical things such as data sharing, or creating reproducible environments that allow one to recreate much more of the research process than you could do just with the final article. Registered reports are a powerful component of Open Science, whereby a paper is conditionally accepted prior to any results even being collected. One fundamental idea here is to remove bias in the published record, as well as to expose the process more.

This tweet from Lorena Barba recently resonated with me. She states the fact that a failed replication/reproduction is less to do with being wrong originally, but issues to do with full and transparent reporting. I feel like much of the issues around reproducibility (often called a 'crisis') could be resolved if we accepted 'failure' as fundamental to research, and allowed more transparency to be injected into the process.

"*Results of research are not under our control, but the way we communicate them is an attempt to impose control*."

What these processes help to do is create an inherent cultural shift towards accepting failure. When we select which results to communicate in articles, and which to omit, we are essentially saying failure should not be exposed as part of the research process. Results of research are not under our control, but the way we communicate them is an attempt to impose control.

When we expose all elements, warts and all, for inspection and re-analysis, we are sending the message that yes, the process is messy, but here's the whole thing. That failure is okay. The methods are something under our control, and thus through embracing failure we impose accountability on ourselves.

"When we reject failure, we create a culture of punishment, artificial rewards, and scientific bias. When we embrace failure, we cultivate a culture of acceptance, tolerance, and learning. Which one would you prefer?"

As an example, a paper we published in 2016, was our exploration of what environmental conditions might have controlled the diversity of animals like dinosaurs and crocodiles over millions of years. For this, we performed hundreds of analyses, looking at whether things like

changes in temperature, sea level, and even the rock record influenced animal diversity. Most of these results were 'negative' – as in, no correlation. But we still communicated them, every single one, because this tells a more complete story. We saw this as critical to being honest and open about our research, and embracing 'failure' as fundamental to the message we wanted to communicate.

When we reject failure, we create a culture of punishment, artificial rewards, and scientific bias. When we embrace failure, we cultivate a culture of acceptance, tolerance, and learning. Which one would you prefer?

Plan S- Time to decide what we stand for, LSE Impact Blog.

The open access (OA) movement is a millennial. Conceived around 25 years ago in conjunction with the internet, open access has become a global movement to promote the free and rapid sharing of scientific information. From these beginnings, few would now argue with this principle, but it is estimated that only around 28% of the total scholarly literature is currently legally OA. Depending on your outlook, this is either, a resounding success, a catastrophic failure, or well… just not something you are concerned about. For OA advocates, such as myself, the consensus would seem to be that we can and should do better.

Enter Plan S: a funder-led, politically-motivated scheme to accelerate the transition to a fully OA world. Recently, the consultation period for Plan S came to an end, generating 1000s of pages responses and igniting a broad debate around OA. As someone who has been in this space for a number of years, in what follows I would like to reflect on this debate and consider what it says about the current state of OA.

We have been here before

I am a geologist and palaeontologist. A foundational principle of our research is: *the past is the key to the present is the key to the future*. Over the past three decades there have been a series of OA debates; notably following the Budapest Open Access Initiative (2001), during the early 2000s in the US over the National Institute of Health's OA policy, throughout the 2000s as part of EU's FP7 and Horizon 2020 funding programs, during the 2010s, in the period of the UK's Finch Report and in Latin America, even before the turn of the millennium with the launch of SciELO in 1997. If you are new to the debates around OA, it is not because they were not happening.

The shape of the current debate around Plan S resembles these previous OA debates and to some extent we can see history repeating itself. As before, OA discussions bring to the surface vested interests. Interests that are not simply commercial, but also linked to academic status and institutional prestige. These interests are pitched against the principle that scholarly knowledge should be a public good and exposes the incredible tension that lies at the heart

of OA, over whether knowledge should be allowed to be exploited by private entities for profit.

If you are new to the debates around OA, it is not because they were not happening.

However, I can empathise with other views. Publishers want to make money in exchange for a service. Senior academics, who have built careers on publishing in traditional journals, might feel that disrupting this undermines their status. Learned societies need revenues generated from publishing to support other activities for their members.

One difference to the Plan S debate is that the ideological and practical case for OA has been won. The question now, is one of implementation and the development of an equitable system for access to research. Thus, Plan S can be seen as a means to accelerate this process of creating an ethical research system and any criticism of the practical aspects of this transition, is all too often interpreted as an attempt to stifle these ideological principles.

Blind spots

The consultation process and the wider discussions around Plan S, have also given rise to a number of new questions and my impression is that there are still huge numbers of voices that are not being heard. One particular sticking point in the consultation, were statements made by established western researchers and research organisations along the lines of: 'Plan S will have a negative impact on junior/global-south/underfunded researchers'. In contrast, EURODOC, perhaps the most representative statement from junior researchers so far on Plan S, shows widespread support for Plan S. The recent launch of AmeliCA in Latin America, also highlights how far behind western understandings and implementations of OA are. These dissenting voices are important as they reveal how centred OA debates are in the global north and amongst an elite group engaged in the scholarly communications industry.

Following this, it seems problematic for organisations submitting feedback on behalf of others (e.g., memberships), and claim (directly or indirectly) to represent voices that were neither consulted during the process, nor directly endorse the statements made. In particular, learned societies, have a double role, representing their memberships as well as their interests as publishers. How are we to know what processes led to the drafting of these statements? Who holds these organisations accountable for such activities?

This in turn raises the question of how different responses to the Plan S consultation should be weighted and assessed. OA and scholarly communication are complex subjects, how do you separate out submissions based on empirical evidence from speculation and disinformation? Should the evidence of an expert researcher be judged the same as that from a publisher, or the representative of a learned society? Can a public consultation really provide a fair representation of the views of all the relevant parties?

Stand up and be counted

7-8 years ago, when I became involved with OA advocacy, I used to have long discussions about how to engage more researchers in the debates around OA. It seems the solution was simple all along – let them know that this is going to disrupt things in their lives and that it is no longer going to be business as usual.

This is perhaps the defining feature of Plan S. Previously, OA has been something that can be ignored, or as a mandate, or policy one must abide by. All of the other accompanying tensions around public versus private, appropriate expenditure of public funds, how OA impacts different communities and demographics, how to reform research evaluation, what the best 'model' for OA is, have resurfaced again, but this time with an incredible amount of engagement that was not present before.

Plan S has added a sense of urgency to the debate and drawn more academics into the bizarre, and complex, world of scholarly publishing, which, by and large, is not something that most researchers have any sort of formal training in. This has drawbacks, as in a field that has a rich history of research and debate, many actors can feel like they are having the same conversations again and again. More generally, I am also concerned about how the different information being shared about Plan S, and OA, is having an impact on the wider understanding of the issues, as well as the development of Plan S itself.

The whole point of Plan S was to disrupt the status quo and transform the world of scholarly publishing. If it yields to those who it is trying to disrupt, at the cost of the greater good, than that's not exactly progress. Open Access is not a business model, so let us stop treating it as such. I believe that science can help us shape the world to be better, and can help solve the enormous problems that our planet currently faces. I do not believe that having it under the control of mega-corporations and elite individuals or institutes helps to realise this, or is in the principles of fundamental human rights.

Those behind Plan S need to come out and vocally state what they stand for, and what they stand against. Cut through the noise, expose the vested interests, and show who they are working for.

Comments for Times Higher Education: University of California break with Elsevier tipped to boost 'global revolt'.

Times Higher Education just published an article about the latest in the ongoing 'Elsevier versus everyone else' saga. It contains a quote from me, so I decided to post my full unedited response to Ellie, the writer, here for full transparency (with permission). Her questions are in italics, and my responses in normal text.

How much of a boost is this for the open access movement?

This depends on which angle you look at it. Statistically, 10% of the USA's total publishing output is pretty huge. So, for the US this is a big deal, but on a global scale still just another drop in the ocean. However, the message that it sends out is much clearer. Coming from UC, this matters, as it is a much more powerful statement. It is the latest in a global revolt against Elsevier (see e.g., Germany, Sweden, Hungary, other US libraries), and shows that the power dynamics are changing.

Do you think this might give other major US university systems the impetus to follow suit?

Yes, I do. If we look at SPARC's big deal cancellation tracker we see this is just the latest in a string of libraries and institutes saying no to the big publishers. I think we are going to see a snowball effect as more universities/libraries realise they have more power when they coordinate, and that the service offered by some of these publishers is discordant with the prices they charge.

And do you think Elsevier's new CEO might lead to changes in the company in the area of open access? Will she be under pressure to loosen their policies?

I strongly doubt that anyone at Elsevier, including their new CEO, is against OA on a personal or principled level. It is virtually impossible to make an argument against the ethical or practical value of OA. The problem that Elsevier, and its staff, have is that they are constrained by the business they operate in. They simply can't support policies and practices that will disrupt their revenue or growth. So, things like Plan S and OA in general, which can be seen to disrupt their 'business as usual' have to be fought against. This is why Elsevier remain one of the smallest OA publishers (6-10% tops annually are OA) and the largest barrier-based publisher. It's just business. I think that internally many of their staff actually struggle with this tension, and want to do things better, but they simply cannot.

What Elsevier need to do is have a massive strategic rethink about their place in this system. If they are service providers, they should provide the services that researchers want in a fair and competitive environment. It is clear that they are not able to do this at the present, and if they want to be part of the future, they need to think about how they treat those who give them content, labour, and money. I do not know of any other industry where such a negative relationship dynamic exists.

If we look at the public comments that Elsevier keep making, they say things like 'We have the best interests of research and researchers at heart'; well, now it is time for them to put their money where their mouths are. They clearly do not know better than researchers themselves, and if they want this to be more than just empty rhetoric, they will lower their conditions and agree to what the research community wants. This does not have to be the big fight that it is playing out to be, and Elsevier and co. might have to lose a bit of profit to readjust. I think they should be open to that reality.

Elsevier and Norway enter into a new €9 million deal. Great.

Whenever a journalist emails me asking for quotes on a piece, usually only a few of them make it into the final article. This is perfectly normal. However, for the sake of full context and transparency, I feel it is good practice to share the complete comments I made. Others may find them useful, and it holds me more accountable. The latest case here is via Inside Higher Ed, in a story about a new 'read and publish' deal between a Norwegian consortium and everyone's favourite publisher, Elsevier. Here are my full, unedited, comments in response to Lindsay's questions.

Is it a good deal or not?

This really depends on your perspective. For the Norwegian negotiation team, this is a better situation then they previously had. The Norwegian negotiation team have a tough problem to solve, between being progressive or disruptive and balancing the needs of the researchers they represent. From that view, this is a success – a small amount of progress. From an outside view, what it looks like is the Norwegians funnelling money into a system that we know is deeply unsustainable, dysfunctional, bad for science, bad for researchers, and not what we want or need for the future. For me personally, it feels like one step forward, two steps back. You can do a lot with €9million with modern technology. This is less than the CEO of RELX gets paid. You could fund a platform like the arXiv for 5-8 years with the same funding. You could do so much more, but instead it is going to propping up an archaic system, with around €3m going straight into shareholder pockets at Elsevier (based on their ~37% profit margins). For me, this feels like an incredible mis-use of public funding, and it is unclear who is holding them accountable for such decisions. However, I empathise with difficult position again the negotiation team are in here.

Do you think Norway should have settled for a deal that increases prices?

No. For one major reason: It is absolutely unclear what these funds are being spent on. It seems like the amount being charged is like 'This is how much revenue we get from you now, and this is how much OA you can get while sustaining that revenue', and completely divorced from the true costs of publishing within an effective, modern communication system. There are countless examples of publishers, journals, and platforms where publishing can be done for as little as 1% of the cost that Elsevier charge. However, the marketplace is so dysfunctional that such competition does not exist. Norway is paying €9m for the prestige of publishing with Elsevier – nothing to do with the cost of publishing, or the inherent value of the research. It shows that the power dynamics in this space are all still backwards.

Would you consider this 'transformative' or in the spirit of other read and publish deals we've seen?

It is difficult to say. I feel the Norwegians have been brave, but not brave enough. For me, the best deal they could have made was 'no deal', and instead invested that money into more

sustainable initiatives, such as non-profit platforms, the Open Library of Humanities, and various other better services. They are signalling that business as usual with Elsevier is okay, when principally and financially, it is not. Elsevier represent one of the biggest threats to the future of science, and democratic access to knowledge out there. Partnering with them in this way is a huge blow to those things, and while again I empathise with the position of the Norwegian negotiation team, I remain disappointed that they did not take a stronger stance.

Springer Nature are not a friend to Open Access.

Times Higher Education just published an article about how Springer Nature, one of the largest scholarly publishers, are helping the transition to Open Access. For those who do not want to login to read, here's a version without that. I am quoted again in this piece challenging the assertions they make, as I believe that Springer Nature are one of the worst scholarly publishers out there, second only to Elsevier. I have recently seen members of their senior staff publicly mocking OA advocates, which did not exactly endear them to me.

In particular, I chose to comment on this piece as spokespeople from Springer Nature, have a history of making erroneous statements about the company in public*. In an era of fake news, this is not something I approve on, and this sort of disrespectful messaging has to be dealt with. Here are my full quotes that I sent to the journalist, Rachael Pells, below.

"*So, if we look at history, Springer Nature (SN) are the definition of bandwagon jumpers. Things like arXiv (1991), SciELO (1997) and PLOS (2000) were leaders on OA from around. SN acquired BMC (2008) and Frontiers (2013, via merger with Nature Publishing Group) to essentially neutralise them as a competitive threat. And also make it look like they cared about OA That does not mean they lead the way. This is like Microsoft saying they lead the way on Open Source because they purchased GitHub. It is propaganda.*

In reality, Springer Nature have been dragged kicking and screaming into the OA space. They are part of a multi-billion-dollar empire that has thrived based on a business model of preventing access to knowledge. OA was obviously a threat to that, so historically they fought hard against it until they could find a way to subvert it into a new revenue stream. Hence, their love of hybrid and high-APC OA. Even now, SN are launching new Nature-branded journals that are subscription only! That is not leadership. It is showing that they are using their brand strength to continue to pervert the scholarly communication process. Nature Communications costs $5000 (+VAT) for authors to publish their own work. No other industry operates this backwards. I refuse to believe that for an efficient, quality publishing system it costs more to publish a paper than it does to live in Bali for a year. (And I know how much this costs). It is daylight robbery, pure and simple, and the taxpayers and researchers are the ones who suffer. And again, statistically, if you look at the proportional figures, if SN are a "leader" in OA

publishing, using the exact same numbers they are also still one of the largest barrier-based publishers out there."

*Here, all of the statements that are made are demonstrably false based on how SN conduct their business in public (one example here).

New study: An overview of Open Access publishing in palaeontology.

Today, Dean Lomax and I **published a new study** that attempts to provide an overview of the state of Open Access journals and publishing in the field of palaeontology. I don't want to repeat what we found too much, so check this **Twitter thread** for a summary of the main discoveries. Please do get in touch if you find this useful, or think there is something missing or can be improved or built upon.

Abstract

Open Access (OA) describes the free, unrestricted access to and re-use of published research articles. Recently, the announcement of 'Plan S' has catalysed a new wave of interest, debate, and practice surrounding OA. Here, we provide a simple overview of the 'OA status' of palaeontology journals within this rapidly shifting landscape. In particular, we focus on aspects such as whether or not there are author-facing charges for Open Access, what embargo periods or restrictions on 'self-archiving' policies are in place, and whether or not the sharing of preprints is permitted. The majority of journals have self-archiving policies that allow authors to share their peer reviewed work via 'green OA' without charge. There is a clear relationship between 'journal impact' and higher charges levied for OA. The most expensive journals are typically published by the large, commercial, publishing houses, rather than the palaeontology community themselves. However, there are a number of article processing charge (APC)-free (diamond) OA journals that can also be considered to be of moderate impact. Until the palaeontology community makes the decision to move away from journal-based evaluation criteria (e.g., the impact factor), it is likely that such high costs will continue to impose financial inequities upon the research community. However, until such culture change occurs, palaeontologists could more widely embrace legal self-archiving as an equitable and sustainable way to progress communication of their research.

Why we shouldn't take peer review as the 'gold standard', The Washington Post. Co-written with Paul Thacker.

In July, India's government dismissed a research paper finding that the country's economic growth had been overestimated, saying the paper had not been "peer reviewed." At a conference for plastics engineers, an economist from an industry group dismissed

environmental concerns about plastics by claiming that some of the underlying research was "not peer reviewed." And the Trump administration — not exactly known for its fealty to science — attempted to reject a climate change report by stating, incorrectly, that it lacked peer review.

Researchers commonly refer to peer review as the "gold standard," which makes it seem as if a peer-reviewed paper — one sent by journal editors to experts in the field who assess and critique it before publication — must be legitimate, and one that's not reviewed must be untrustworthy. But peer review, a practice dating to the 17th century, is neither golden nor standardized. Studies have shown that journal editors prefer reviewers of the same gender, that women are underrepresented in the peer review process, and that reviewers tend to be influenced by demographic factors like the author's gender or institutional affiliation. Shoddy work often makes it past peer reviewers, while excellent research has been shot down. Peer reviewers often fail to detect bad research, conflicts of interest and corporate ghost-writing.

Meanwhile, bad actors exploit the process for professional or financial gain, leveraging peer review to mislead decision-makers. For instance, the National Football League used the words "peer review" to fend off criticism of studies by the Mild Traumatic Brain Injury Committee, a task force the league founded in 1994, which found little long-term harm from sport-induced brain injuries in players. But the New York Times later discovered that the scientists involved had omitted more than 100 diagnosed concussions from their studies. What's more, the NFL's claim that the research had been rigorously vetted ignored that the process was incredibly contentious: Some reviewers were adamant that the papers should not have been published at all.

Similarly, fossil fuel industry interests have tried to distort the public debate on climate change by sponsoring research and exploiting the prestige of peer review, undermining the overwhelming scientific consensus on the topic. For many years, climate sceptics published studies in the journal Energy & Environment, which had little credibility among climate scientists, even though it had a peer review process. (One of its articles said inaccurately that the sun is made of iron.) Typically, in the peer review process, editors choose reviewers, and E&E's long-time editor, Sonja Boehmer-Christiansen, is an avowed climate change sceptic: "I'm not ashamed to say that I deliberately encourage the publication of papers that are sceptical of climate change," she told the Guardian in 2011. Indeed, in the early 2000s, when scientists were just figuring out how much humans were changing the climate, public figures such as Sen. George V. Voinovich (R-Ohio) began citing research published in the journal in the name of delaying political action.

A few years ago, it emerged that Willie Soon, a scientist at the Harvard-Smithsonian Center for Astrophysics, had accepted $1.2 million from fossil fuel interests to publish studies, which he described as "deliverables," in academic journals. (Much of his research has argued that variations in the sun's energy can explain most recent global warming and that humans have

had little effect on climate change, a thesis rejected by the majority of experts.) Peer review did not uncover these vested relationships: The editor of the Journal of Atmospheric and Solar-Terrestrial Physics told a reporter that it relied on authors to be truthful about conflicts of interest.

Just as peer review fails to detect funding sources, it often also fails to catch ghost-writing, in which companies draft articles for academics who go on to publish them under their own names, sometimes with few or no changes. The editor of one journal told the Senate Finance Committee in 2010 that he suspected that at least a third of the papers submitted to his journal were ghost-written by public relations agencies and paid for by pharmaceutical companies. Such articles have appeared in dozens of journals, and ghost-writing scandals have involved professors at the University of Pennsylvania, Brown and Harvard. Last year, court documents revealed that Monsanto ghost-wrote articles that were published in peer-reviewed journals to counter research on the carcinogenicity of the pesticide glyphosate and to attack regulatory bodies.

Peer review has also sometimes stymied important research. Senior scientists are more likely to be asked to assess submissions, and they can shoot down articles that conflict with their own views. As a result, peer review can act as a shield to protect the status quo and suppress research viewed as radical or contrary to the established perspectives of referees. A 2015 study of 1,000 medical journal submissions found that of the papers that were eventually published, the 14 that became the most frequently cited were initially rejected. Ground-breaking studies by Sir Frank MacFarlane Burnet, Rosalind Yalow, Baruch Blumberg and others were rejected by peer reviewers, yet later led to Nobel Prizes.

Scientists understand that, despite its limitations, we need peer review: It is hard to imagine how we would get along without it. They also understand that it's a human process and thus rife with human failings. But these subtleties are rarely communicated to the public. With more transparency about the publication process, we might have a more nuanced understanding of how knowledge is built — and fewer people taking "peer-reviewed" to mean settled truth.

'Transformative' open access publishing deals are only entrenching commercial power, Times Higher Education.

Plan S has already been credited with sparking something of a revolution in journal publishing. Major publishers are beginning – slowly and reluctantly in some cases – to replace their traditional "big deals" with what are being called "transformative deals". Often negotiated with national consortia of libraries and research institutes, these combine access to subscription journals with an ability to publish open access without any additional charge.

However, I believe that we should think a lot harder before celebrating a tipping point.

The open access movement has always been intimately bound up with a critique of the whole concept of handing over billions of pounds of public money to wildly profitable private companies in exchange for publishing papers that are written, reviewed and edited by academics. Yet the current "transformative" deals do precious little to drive down margins that are often in excess of 35 per cent.

For example, Germany recently paid €26 million (£24 million) to Wiley to publish 9,500 open access articles a year over three years, at €2,750 per article. Wiley has an operating profit margin of around 29.5 per cent, which means that about €7.7 million of that fee will go straight into its shareholders' pockets. A similar deal between Wiley and Dutch universities has an estimated cost of €1,600 per paper, but there are suggestions that it has, in practice, cost a lot more so far. However, we do not know the true figures as the contract details are often kept secret, despite involving public funds.

This consolidation of historic spending decisions, focusing funds on a few dominant players, makes it harder, not easier, to truly transform scholarly publishing. A recent study even shows that the current state of open access publishing, with its increasing favour on commercially driven companies, is driving hyperinflation in article processing charges, exacerbating universities' lack of market control.

Springer Nature estimates that it costs between €10,000 and €30,000 to publish in one of its *Nature*-branded journals. By contrast, a recent study suggested that a paper should ordinarily cost $400, rising to $1,000 in highly selective journals. The *Journal of Open Source Software* only costs about $2.71 (£2.23) per article, while the arXiv preprint server cost $1,019,665 to run in 2017, during which it published 123,523 articles, amounting to about $8.25 per article.

Based on these numbers, we are wasting huge amounts of the true cost of publishing on inefficient systems and private profits. This is a public scandal and a crisis of the highest order. Remember, there is no price competition here, and no accountability. Every single journal and every single research article is unique: you have to have them all. A representative of the European Commission has even admitted that this is just one aspect of the dysfunctional "market" that scholarly publishers, institutions, funders and researchers have together created.

The commission is allegedly monitoring this situation, and not before time. The next time one of these "transformative" contracts is negotiated, the signatories need to justify to the public why they are not choosing more financially sustainable or non-profit routes. And greater scrutiny needs to be applied to those "transformative" deals that have already been signed.

It is not as if there is a shortage of alternatives to the commercial publishers. UNESCO recently announced its support of the Global Alliance of Open Access Scholarly Communication Platforms – a more sustainable, scholar-led, non-profit network – in order to help countries

to achieve the Sustainable Development Goals. The Free Journal Network consists of journals that conform to the Fair Open Access Principles: controlled by the scholarly community, with no financial barriers to readers and authors. And around 73 per cent of fully open access journals indexed in the Directory for Open Access Journals do not charge authors to publish.

Instead of recklessly funnelling billions of taxpayers' money into for-profit entities, funding bodies and research institutes could easily support these more sustainable ventures instead. This is already happening in some parts of the world, with initiatives such as Redalyc and SciELO in Latin America demonstrating leadership.

The current model of scholarly publishing contains a disastrous blend of Stockholm Syndrome and cognitive dissonance. Researchers are helplessly locked into the system because of an over-reliance on journal brands for their evaluations, including for promotion, grants and tenure. As such, we are forced to continue to support the notion that where we publish is more important than what we publish – despite all having been told as children not to judge a book by its cover. I find it absurd that the most supposedly intellectual people in the world cannot find an evaluation system better than this.

Every time we sign one of these so-called transformative contracts, which often contain multi-year lock-ins, we lose the opportunity to create something more just, sustainable, efficient and effective. We actively work against efforts to return control of publishing to the academic community. It is time to take a step back and to think again about what we really want.

In focus: Jon Tennant on open science and life as a nomadic researcher. Interview with IGDORE.

1. Tell us a bit about your professional background.

It's weird. Many moons ago, I was a simple geologist, and spent most of my time falling in love with rocks. In an attempt to diversify my skill set, I started getting more involved in science communication alongside my studies and research. This eventually led to a position working in science policy at the Geological Society in the UK. Here, I was fortunate to learn more about how science and policy interact, and put my communication skills to practice. This proved to be very useful, as I began to engage more with the evolving scholarly publishing and higher education landscape at a time when Open Access and Open Science were really taking off in the UK. After working here, I started a PhD in Palaeontology, and these additional skills and knowledge helped me to be quite effective in disseminating my research, and I became an active member of the growing open science community. After my PhD, I worked at a tech start-up called ScienceOpen, based in Berlin, which gave me a deeper understanding of how the scholarly publishing and communication worked. Now though, I have sort of gone rogue or independent as a researcher. I divide my time now between palaeontological research, studying elements of the publishing system such as peer review, as well as

challenging the privatisation of scholarly research. Oh, and writing kids' books about dinosaurs. Right now, I'm based in Paris, and quite excited about where the future of this adventure lies!

2. Why did you join IGDORE?

IGDORE feels like good organisation, with its mind and mission in the right place. It seemed like the perfect home for researchers like me; sort of wanderers who know that academic culture isn't really something for them, but still have an innate passion for research. It's nice to be part of a like-minded community for sharing knowledge and support. The fact that the campus is based in Bali played a small part too.

A lot of the debates happen on Twitter, which is not a good place to have civil, constructive, and thoughtful conversations. One consequence of this is that it looks like there is a lot of in-fighting among whatever the 'open science community' is, which is not a good appearance.

3. You have a quite nomadic lifestyle. How do you combine that with your scientific work? And how does a typical work day look like?

There really is no such thing as a typical day! I wake up every morning, check out my to-do list, and see what I feel like working on. It's really quite liberating. These days, it is quite easy to do things like research, writing papers, community building and communication, from remote positions. I find the lifestyle gives me the personal freedom to work in a way that allows me to feel freer, more creative, and more in control. I value this sort of freedom quite highly, so it works well for me. As long as I get things done, I don't mind where I do them. Most of the 'nomading' I do is for invited talks at conferences, and I usually like to add extra time on around them so I can explore new places, and find neat little places to work from.

4. The movement for open and replicable science is growing quickly, in particular in some disciplines and some countries. Is there anything you would like to see more or less of in this movement?

A lot of the debates happen on Twitter, which is not a good place to have civil, constructive, and thoughtful conversations. One consequence of this is that it looks like there is a lot of in-fighting among whatever the 'open science community' is, which is not a good appearance. So, I would like to see more care from people in how they treat others in online forums, but I guess this is the same for the whole internet really. In terms of more of, I would like to see more empowerment. There are countless numbers of people who could be designated as leaders in this space, and I would like to see more them being more courageous and inspiring for others, to help build a really strong, thriving, and sustainable community. I would also just love to see more communication across communities. Often it feels very isolated, with publishers, policymakers, librarians, students, and researchers all having their own conversations. Open Science for me is primarily about breaking down walls, so let's make sure that we do this and focus on building bridges too.

5. How would your ideal work life look like? Where would you live, where would you work, and how many hours would you work per week?

Free! I would live wherever my mind and heart took me, without restriction on travel. I would love to work from anywhere, as long as it is comfortable, with good people, and great coffee. IGDORE campus, for example! As for hours per week, this really varies. I make sure to take a lot of personal downtime, reading, writing, and meditating. This means that when I have my uptime for work, I am at my absolute best and work more effectively than if I were doing a 9–5. I think that we should be able work when we feel like it, and also relax when we need it. Doing nothing sometimes is beautiful.

6. What are your professional plans for the next few years?

I honestly don't have that far planned ahead yet! A few years ago (don't laugh), I started a personal adventure that I call my 'journey to nowhere'. I don't know where all of the things I am working on, personally and professionally, are going to end up. But I am more focused on the adventure and the process than the end point or goal. It's not the most stable life, but I feel it's something I have to be doing — for myself, my work, and those I interact with. So, I'm spending a lot of the next few months bouncing around the world to give talks on open science, which I really love. I'll be moving to Denmark at the Southern Denmark University after to help light an open science fire there. After that, I'll probably come to Bali to see you all, and then touch back down in Paris. Here, I'll continue working on developing the Open Science MOOC, and whatever research projects I feel like working on. The fun never stops! After that, well, uncertain, and I'm okay with that. The temptation is to go 'full nomad' again and keep traveling the world while doing this stuff. But that can be financially stressful. So, I might look into setting up a research group, or joining one, probably somewhere in Europe, to continue working on the future of open scholarly communication.

7. What would you like to see more or less of by (or within) IGDORE?

More people joining, and embracing freedom as part of their research lives. Who knows where it might take you! :)

Do we need a new research field of Peer Review Studies?

Today, Tony Ross-Hellauer and I have a new preprint shared on SocArXiv. It's about the limits to our understanding of peer review. Rather than simply being another meta-analysis of all of the things we do have evidence for about peer review, we tried to think of it a different way: what are all the things we DO NOT know about peer review? And well, it turns out, quite a bit!

This was quite a difficult cognitive exercise, as the potential for what we don't know is well, vast. There are likely to be gaps and errors throughout, and if anyone has the time, we would love any feedback. Criticisms and kind words equally appreciated! Either way, we hope that you find this useful, and it will be interesting to see where our proposal leads. Here's the abstract below:

Peer review is embedded in the core of our scholarly knowledge generation systems, conferring legitimacy on research while distributing academic capital and prestige on individuals. Despite its critical importance, it curiously remains poorly understood in a number of dimensions. In order to address this, we have programmatically analysed peer review to assess where the major gaps in our theoretical and empirical understanding of it lie. We distil this into core themes around editorial accountability, the subjectivity and bias of reviewers, the function and quality of peer review, the role of the reviewer, the social and epistemic implications of peer review, and regarding innovations in open peer review platforms and services. We use this to present a guide for the future of peer review, and the development of a new research discipline based on the study of peer review. Such a field requires sustained funding and commitment from publishers and research funders, who both have a commitment to uphold the integrity of the published scholarly record. This will require the design of a consensus for a minimal set of standards for what constitutes peer review, and the development of a shared data infrastructure to support this. We recognise that many of the criticisms attributed to peer review might reflect wider issues within academia and wider society, and future care will be required in order to carefully demarcate and address these.

Collaboration without Elsevier is the key to open access and open science.

This morning, Times Higher Education published a strange and awkward piece from a representative of Elsevier. If you have a subscription you can view it online here. Unsurprisingly for Elsevier though, it contained a number of misleading statements. As such, I left a comment on the article challenging many elements of this, which you can also view here. Just as a note, it should not be left to individuals like me to combat this sort of behaviour. It is tiring and time consuming to constantly be a watchdog in this space, and I call upon others to speak up and use their expertise to challenge the spread of misinformation from Elsevier and others.

For those without access through the loginwall though, here is my comment re-posted in full:

There are a number of misleading and generally awkward statements in this piece.

If Elsevier 'deeply regretted' the situation with the University of California (UC), perhaps it would lower its negotiation stances instead of bullying UC and shutting off access to research for their researchers. UC has, in fact, had to fact check and give a rebuttal on many of Elsevier's misleading claims about the negotiations.

If Elsevier fully supported Open Access (OA), then why is it one of the smallest OA publishers by proportion. 7% gold by its own measure. Absolute numbers mean very little here compared to the relative proportions at other OA publishers like PLOS, BioMed Central, PeerJ, and the thousands of fully OA journals out there, which all have 100% OA. And let us not forget the heroic efforts that Elsevier have done in the past in stopping progressive OA policies, including running smear PR campaigns against it.

If Elsevier 'serves' the research community, then why is it so difficult for them to give researchers what they want? This contradicts the statement that Elsevier regrets the current state of affairs. If they did, then they would adjust their services accordingly; for example, by lowering prices, removing embargoes, stopping advertising impact factors, etc.

The comment about investing significant resources into each published article is preposterous. Elsevier embeds hyperlinks into PDFs. This was technologically feasible 20 years ago.

It is misleading to state that green OA is associated with an embargo period; it is about authors self-archiving a version of their work on a repository. It is further misleading to associate 'gold' OA with a fee; this is about free accessibility at the journal website. Elsevier knows this. But continues to perpetuate falsehoods and myths to mislead their customers. Evidence against many of the statements in this piece can be found here.

If Elsevier supports OA so much, then why are only 7% of their articles gold OA? Is it not because authors are unwilling to pay the prices they charge? Elsevier puts the blame at the feet of the authors for not choosing their model, when the reality is that they have made it such a difficult and unsustainable level to reach.
The statement about being below the industry average needs a supporting citation. Especially as we know that there are around 3 times as many journals as Elsevier publish out there which charge zero APCs, according to the DOAJ.

The quality statement too needs a supporting reference. If Elsevier equates citations per article with quality, then they are continuing to perpetuate misleading information.

When Elsevier uses words like 'sustainable', I do not think it means what it thinks they mean. The term 'sustainable' means maintaining Elsevier's 37% profit margins and projected growth. Everyone else means not wasting hundreds of millions of dollars and more on a for-profit publisher that continues to aggressively mislead its customers, and lobby against progressive OA models, when a number of better, non-profit, community-led initiatives exist.

The fact is that it is this sort of propaganda piece that continues to make Elsevier one of the most despised companies in the world. Elsevier throws around misleading and unsupported statements that are so far from the truth, and expect to keep getting away with it.

I am surprised that a piece riddled with so many factual inaccuracies was able to make it past the editors of THE, and their typically high standards. For a more evidence-based account of Elsevier's practices, I suggest this report via Education International that I helped to write. It gives a much more accurate account of Elsevier's business practices.

Interview: Jon Tennant, author of 'The State of the Art of Peer Review'. Interview with FEMS.

Were there any particular factors that lead you decide to write *The State of the Art of Peer Review*?

"Well, the main one was that David Nicholas, Editor of this special volume, sent me an invitation to write a balanced review of the state of art in peer review, with early career researchers especially in mind. This was based I think largely on a recent paper that myself and more than 30 awesome people from around the world openly collaborated on to brainstorm on how new social technologies could be applied to peer review in some way."

"I saw this as a way to extend this paper and push forward the ideas, both in terms of my thinking about it, but also in public discussion of these things. I'm finding peer review to a really cool beast to try and wrap my head around, so this was a great opportunity to try and open up my thinking in this space. My only condition was that it would be Open Access, which FEMS kindly obliged to for free – thanks!"

What is the peer review system like in your scientific field, palaeontology? Are there any unique traits that would surprise people working in other fields?

"I suspect that it is largely the same as many other fields. I've published a range of different types of papers, to those describing new specimens, to full on analytical and data-driven ones. Typically, the peer review style for these differs; for example, for those describing new specimens/species, it really requires having an in-depth knowledge of those specimens, or at least related ones, preferably based on first-hand experience."

"In some cases where the fossil groups are poorly known or researched, this can make finding referees difficult, especially ones who you aren't working with already! For more analytical ones though, one thing I found surprising was that I don't think any referee has ever looked at the code/data used, or tried to see if they can test or reproduce the results."

"To me, this is one of the core functions of peer review, making sure that things are actually verifiable, and it seems odd to have this largely absent. Go figure."

"I think peer review is becoming more difficult in our field in some respects though, as it's becoming more and more interdisciplinary all the time."

“For example, it now includes everything from high energy physics and microbiology through to biomechanics and biochemistry. This makes finding reviewers capable of peering through different lenses into research more challenging, especially when some of this research is really pushing boundaries of what we know forward.”

“Generally though, the pre-publication peer review process for me has always been productive, civil, and ultimately improved the research in one way or another. I think part of this is that the Palaeontology community is quite small and close, and aware that there could be repercussions for behaving in a way that isn’t proper.”

“However, I also know that I have been quite lucky in this respect, and know others in the field who have been reduced to tears from the review process, or left academia altogether feeling shocked and bewildered. Of course, these are the stories we often don’t hear, as the stories are only told by those who tend to persevere within the present system.”

In your view, what is the biggest problem with the current state of peer review?

“I have to pick one? ;)”

“I would have to say it’s the overall secrecy, and the problems and questions this creates.”

“For example, there is little way to detect or penalise abusive or bullying behaviour, little accountability for decision makers, little insight into whether it’s actually doing what we think and hope it’s doing either in theory or practice, and instead we just sort of have to trust that it is actually doing what we want. And a lot of evidence suggests that it’s not, or at least not in an optimal way.”

“But also it seems that many researchers seem generally apathetic towards this state, and even sometimes aggressive to those who voice concerns against the present review system. Which seems strange to me that we have sort of just abandoned a system to fate and often ceded control to commercial entities, which ultimately controls the flow of scientific knowledge and the structure of our academies, as well as researcher careers.”

“The (main?) reason for this is that this traditionally closed system has helped to create the present status quo in academia and scholarly communication, and any criticisms towards peer review can trigger a sense that they are undermining or challenging the very foundations of scholarship or the legitimacy of research communities.”

“So, for some, the secrecy creates a place of comfort that protects the established way of doing things, while at the same time making it very difficult to ask any questions about how peer review truly operates at different levels. This makes any sort of innovation or change pretty difficult.”

Looking from a more positive angle, has anything been improving in recent years?

“Goodness yes!”

“Just this week we saw the amazing collective effort from publishers, spearheaded by ASAPbio, to commit to sharing their review reports. For me this is a huge signal that the present system is being disrupted in a way that is more transparent and beneficial to the wider research community, but also in a way that has buy in from across stakeholder groups.”

“I think efforts like this from the publisher side of things are important. Peer review is a key part of what defines the legitimacy of their brands, and thus their overall business stability, and therefore making shifts like this is brave, but also a good indicator that system-wide shifts towards being more ‘open’ are happening. Huge kudos to Jessica Polka and the ASAPbio community for driving this.”

“But as well as that, we are seeing increased cross-stakeholder discussions, with more questions being asked and novel solutions and ideas popping up all the time. There are some wickedly smart and passionate in this space, and it’s great seeing what the next steps they might conjure up are.”

“That we now have editors, journalists, students, researchers, librarians, funders, learned societies and publishers all engaged in wider discussions about peer review and the scholarly communication system to me is quite incredible, and a great space to be in at the moment. I think that with this we are going to start seeing increased efforts decoupling peer review from traditional journal or article-based processes in the future.”

This year, the focus of Peer Review Week is “Diversity & Inclusion” – does the current state of peer review have a problem with diversity and inclusion?

“Ask me again after PRW has finished and we look at the people who are engaged in the discussions.”

“I mean, to me the answer is an almost unequivocal yes, in many respects. However, I think this is more broadly reflective of the fact that we have insurmountable diversity and inclusion issues that perpetuate academia and impact virtually every part of research from the granting process all the way to research evaluation. Hopefully those participating in PRW will be mindful of this, and really help to ask and answer some difficult questions of ourselves and the system we operate within.”

What is the most important reason for increasing diversity & inclusion in peer review?

“When we embrace different viewpoints from across the spectrum, including those that are markedly different from our own, that is when beautiful things in research happen. Really the same is true of virtually any aspect of our lives, in that if we only hear the same things from the same people over and over again, we get a ‘broken record’ effect and basically stagnate.”

“So, for me, making sure that we are including diverse voices in an inclusive space is firstly the right thing to do, but also creates a better process for us all (as the opposite is stagnation and exclusion).”

What one thing would most improve diversity and inclusion in peer review?

“Not ask the middle-class hetero European white dude how to answer that question ;)”

“Seriously though, it is people like me who should be shutting up and listening to those voices who are systematically marginalised by the present way of doing things. If we want to promote inclusivity and diversity, we first have to recognise the symptoms that promote exclusivity and homogeneity.”

“So, my usual recommended solution is not to have too much of a public view on these things, and to actively invite those who we wish to ‘include’ to give their views instead, while also creating an environment that helps to empower those individuals to do so.”

“That being said, I do believe that there is so much more, and some specific things that we, as I guess someone who represents the majority demographic in this space, can do too. For example, being mindful and aware that systemic biases exist, and doing what we can each do to improve them.”

“This means not inviting the same speakers to our PRW panels/events that we always do, making conscious efforts to increase participation from voices who are usually marginalised (including in agenda setting), declining invitations and recommending other voices instead, and simply shutting up some times or saying no. If you are in control of a microphone, pay attention to who you are giving it to.”

“As an extension to this, we need to make sure that we aren’t just paying ‘inclusivity’ lip service, and only applying it in a superficial manner.”

“For example, simply getting a diverse group of people to participate in something like peer review for the sake of a box-ticking exercise. If we want to truly promote inclusivity, we need to recognise that often the rules are still made by the same people, but others don’t know how to play the game.”

“We want to create an environment where diverse voices are actually helping to set the rules of engagement, not just being invite to conform to them. We should make sure that we aren’t just inviting people for the sake of representation, but with a full awareness of what that representation brings, and how to foster the environment that promotes and sustains this.”

“An Indonesian colleague here told me recently “*I am not just an object to be included*.”, when we were talking about these things, and that resonated with me quite hard.”

“One thing I suggest in the paper, on a more practical level, that could improve this state is to provide sufficient training and support, particularly for more inexperienced or at-risk reviewers, as well as risk-mitigation strategies, that would enable researchers to be comfortable experimenting with peer review, including innovative forms of it.”

“But really, if we want to address these things in peer review, we have to recognise that there are wider systemic issues that we need to fix first. And to help fix these things, we have to embed inclusivity in our principles right from the start, and make sure that the voices we need to change these things are being heard all the way to the top.”

“Not blockchain.”

2020

The great brain robbery. Co-written with Charlotte Wien. Originally appeared in Weekendavisen in Danish.

It has been 10 years since the charges against Milena Penkowa in 2010 gave rise to academic self-examination and clean-up in its own ranks. However, Penkowa was neither the first nor the last or, for that matter, much worse or better than the many who have since been accused of scientific dishonesty on the international research scene. She and her like-mindedness are just symptoms of how research has adopted an archaic infrastructure. One that is full of secrecy and combined with some very large financial interests that, on the one hand, hinder progress and, on the other, both enable and almost encourage cheating. We must expect much more from the same drawer unless drastic changes occur.

To look for the roots of evil, we will dig a deep spade into the mid-1960s, when librarian and businessman Eugene Garfield founded the Institute of Scientific Information (ISI), which despite its publicly sounding name was a private enterprise. ISI's primary product was a printed list of scientific articles. Many of these lists were already available, but this one was different because it also contained information about who had cited which articles. It was by no means a gold-edged business to publish such bibliographies or, for that matter, other publications addressed to the researchers. Publication was associated with very high production and distribution costs. Even when the readership was small, the only way costs could be recuperated was by having the researchers giving their articles to the publishers and also have them be responsible for both editing and quality control (peer review). And this worked well because the publishers had very loyal customers: the university libraries.

But with the advent of digitization in the early 2000s, the publishing and distribution costs of publishers mostly disappeared. The scientific journals and the scientific bibliographies became digital. What was special about Garfield's bibliography, however, was that they did not digitize just a bibliography, but also a gigantic database containing data on researchers'

productivity. It is now owned by Clarivate Analytics, and primary product is the Web of Science (WoS).

The 2000s were, in many ways, a formative period for much of the turmoil that dwells in the academic world today and is the subject of this post. It was also at the beginning of the 2000s that the New Public Management (NPM) reforms made their entry into the Danish universities. At that time, the NPM winds had already ravaged the international academic scene for some time. In short, simplified NPM covers administrative reforms intended to make the public sector more efficient. The starting point is an assumption that the public sector is inefficient, but can become effective if it is run in the same way as a private company. Productivity can be increased, among other things, through free competition and by channeling funds away from the low-performing and towards the high-performance units. But in order to know whether a unit is doing much or little, productivity must be continuously measured and evaluated. The Danish University Law of 2003, which created the goal management of the universities through the development contracts, is a perfect example of the new demand for productivity and efficiency goals. Because, by virtue of the development contracts, the universities had to precisely document their goal achievement.

It was therefore quite convenient that Jorge E. Hirsch, in 2005, founded the so-called h-index as an indicator of a researcher's productivity. The calculation of a researcher's h-index is based on calculations of the number of publications and citations, i.e., based on the data Garfield had collected since 1964. Therefore, the h-index quickly became an international de facto standard for researchers' productivity. As you can probably see, our point is that NPM, WoS and h-index constitute a kind of trinity that goes hand-in-hand. A new measure of productivity, available data, and a demand for efficiency metrics. However, we must emphasize that individual measurements of researchers 'effectiveness using the h-index are not included in universities' development contracts as such, but are used in this context only to symbolize the spirit of the early 2000s.

On the surface, it looks innocent. But the Trinity created a breeding ground for a lot of weeds. For the re-enrollment of the universities meant that around them emerged an industry of privately-owned companies whose mission was to "help" the universities and their researchers to increase productivity and win the competition. We here define that industry as the para-academic industry. It includes e.g., ranking agencies, scientific publishers, countless software providers offering platforms that claim to be able to promote the visibility of researchers, and more.

We will illustrate our point through an elaboration of the scientific publishing business model. Because, as mentioned, Garfield had created a bibliography that could be sold to the university libraries. What turned out to be just as valuable, however, was the data he had collected on the researchers' publication behavior and citation patterns. After all, under the new NPM paradigm, they could be sold to universities' management, who thirsted for data to

document the evolution of research productivity. Next to WoS, the company Clarivate Analytics developed the database created InCite, where universities buy access to their own data to measure their productivity. The publishing giant Elsevier, of course, saw the same scam and developed the research database Scopus and the database SciVal. The research libraries subscribe to the research databases and the universities' management, which must constantly be able to document productivity increases, buy access to the databases to be able to pull data on researchers. All based on the data - or raw materials - that the universities themselves have provided free of charge to these companies.

This is 'big business'. Members of the para-academic industry are among the world's most affluent companies. Three of the major publishing giants have higher profit margins than Apple, BMW and Woolworths. Elsevier, for example. has a net profit margin of 37% (Apple computers has 21% for comparison) and a total annual revenue of around $7.5 billion USD for its parent company RELX, or DKK 70 billion, of which about 70% comes from public institutions, i.e., taxpayer funds. No less than 37% of Elsevier's annual earnings turn into profits, which slip into private pockets.

But what does all this have to do with Penkowa and her like mind? The thing is that the para-academic industry feeds off the discrepancy between the old cost-heavy paperwork and the new (digital) NPM paradigm. Despite the availability of new technology and the money supply in the scientific publishing world, the lack of innovation in the industry is striking: Scientific articles are still published by publishers who have not given the publishing practice anything groundbreaking new since the invention of hyperlinks in the mid-90s and which generally use the same form of dissemination, as in the 17th century, when 'modern' scientific publishing was created. Had the forces already in the 2000s seen the possibilities for far more open and advanced forms of publishing had the power they had, then scientific publishing practices would have taken a different approach today.

For it was also at that time that the Open Science movement was born. Open Science is a kind of counterculture, or medicine if you will, against the ills created by the combination of NPM and the para-academic industry. The intention of the Open Science movement is to open up all parts of the processes involved in scientific work – i.e., make them transparent. It is not only about making public tax-funded scientific publications available for free, but also making the publication processes far more flexible, making data freely available and open with the possibility of continuous and open peer review. It is about involving citizens in the research processes or at least ensuring that they can at least look along the way in the processes and see what they are helping to finance. For how can something that goes on in small closed circles, which are exclusive and secretive, be regarded as a reasonable standard for scientific work? Why, just about the publication processes, have we bought something that is a core value of the scientific world's self-understanding: openness or transparency if you want to.

It is here, in the gap between the new and the old paradigm, that the roots of the misfortune that is ravaging the academic world have its roots and the secret scare is its fertilizer: NPM's test-road tyranny tempts weak souls to optimize for their own career gain. It is as easy as that and in fact, very few get caught with their fingers in the cookie jar. And even when they do, it is far from certain that, because of all the secrecy in the research world, it comes to the knowledge of their employers - the universities.

It's not hard to cheat with either experimental rats or authors. They exist within monopoly-like conditions in which the publishers own the publications, access to them, and data on the behaviour of the researchers. And by all means they fight any attempts at radical renewal and democratisation, and prevent any renovation of the scientific infrastructure that the new technology could otherwise help to provide. The scientific publishers deliberately prevent transparency about the quality assessment (peer review, which is typically secret) and about data that is not sufficiently made available in the current publication formats.

Dear politicians, citizens and colleagues, you must help us. Our public institutions should serve the public and not be financial dairy cows for private companies. We have to take back control and do away with the existing paradigm. We must develop new transparent procedures and deal with the secret scare in research. No one has yet taken seriously the leadership of the Open Science movement. We could do that in Denmark for the benefit and enjoyment of a whole world that more than ever needs research to serve the interests of our global community.

Other relevant publications

- Lead author, Ten hot topics around scholarly publishing
- Lead author, Foundations for Open Scholarship Strategy Development
- Lead author, the Academic, societal and economic case for Open Access
- Lead author, Open Science in Dinosaur Palaeontology
- Tennant and Lomax, An overview of Open Access publishing in Palaeontology
- Editor and lead author of 'The evolving preprint landscape: Introductory report for the Knowledge Exchange working group on preprints'
- Formal complaint about Elsevier and their role in the Open Science Monitor to the EU Ombudsman
- Author of a report on behalf of Education International, Democratising Knowledge: A report on the scholarly publisher Elsevier
- Co-author of the Open Science Training Handbook
- Lead author, A multi-disciplinary perspective on emergent and future innovations in peer review
- Author, The state of the art in peer review
- Co-author, Open Up: A Survey on Open and Non-anonymized Peer Reviewing
- Co-author, The limits to our understanding of peer review
- More than 100 interviews and blogposts at the ScienceOpen blog
- Co-author, Open Science Feedback on the Guidance on the Implementation of Plan S
- Co-author, Feedback to Coalition S on Plan S Implementation Guidelines
- Co-author, RELX referral to EU competition authority

Other relevant media appearances

- Criticizes deals with giants: – Misuse of public funds, Khrono (In Norwegian).
- Qatar National Library promotes International Open Access Week 2019, Press Release.

- Because everyone must be guaranteed access to scientific journals – Internazionale (in Italian).
- Germans to close "transformative" deal with Springer Nature – ScienceGuide.
- Journal's plan to review preprints aims to kill 'desk rejects' – Times Higher Education.
- Springer Nature proposes Open Access model transition – Times Higher Education.
- Elsevier agrees to first read-and-publish deal – Inside Higher Ed.
- Commission defends Elsevier monitoring decision – ResearchResearch.
- Hope – and a welter of concerns – greets Europe's radical open access plan – Science Business.
- 'You never said my peer review was confidential' – scientist challenges publisher – Nature News
- Why high profile journals have more retractions – Nature News
- Career advice: How to peer review – Times Higher Education
- Tweeting and rule-breaking at academic conferences – The BMJ
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