

Ethical publishing: how do we get there?

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Abstract

The scientific journal publishing model is deeply unethical: today, a few major for-profit conglomerates control more than 50% of all articles in the natural sciences and social sciences, driving subscription and open-access publishing fees above levels that can be sustainably maintained by publicly funded universities, libraries and research institutions worldwide. About a third of the costs paid for publishing papers is profit for these dominant publishers' shareholders, and about half of them covers costs to maintain the system running, including lobbying, marketing fees and paywalls, which in turn restrict access of scientific outputs from being freely shared to the public and other researchers. Thus, money that the public is told goes into science is actually being funneled away from it, or used to limit its access. Alternatives to this model exist and have increased in popularity in recent years, including diamond open-access journals and community-driven recommendation models that are free of charge for authors and minimize costs for institutions and agencies, while making peer-reviewed scientific results publicly accessible. However, for-profit publishing agents have made change difficult, by co-opting open-access schemes and creating journal-driven incentives that prevent an effective collective transition away from profiteering. Here, we give a brief overview of the current state of the academic publishing system, including its most important systemic problems. We then describe alternative systems. We explain the reasons why the move towards them can be perceived as costly to individual researchers, and demystify common roadblocks to change. Finally, in view of the above, we provide a set of guidelines and recommendations that academics at all levels can implement, in order to enable a more rapid and effective transition towards ethical publishing.

Introduction

Ideas are powerful things. They underpin our societies; they cause new technologies to spring into existence, and shape our very experience of the world. Increasingly, humanity's capacity to adapt to a changing world depends upon our capacity to generate, exchange, filter, modify and act on ideas, in light of new information. Humans are increasingly faced with acute crises (Díaz et al., 2019; Ripple et al., 2020; Steffen et al., 2018; Trisos et al., 2020) and the free exchange of high-quality ideas and incoming information is thus of paramount importance to how we face these challenges. Thus, the medium we use for this exchange needs to be fast, efficient, and widely accessible.

Unfortunately, the currently predominant model for scientific exchange fails to meet these needs. A great number of studies have shown that traditional scientific publishing imposes unnecessary impediments to the sharing of ideas and information, in order to extract profit, and promotes a hierarchy of journal esteem as a proxy for the true quality of ideas (Aczel et al., 2021; Allahar, 2021; Houghton, 2001; Larivière et al., 2015). This model restricts the questions that we ask, and who does the asking, while undermining the free and open evaluation of science that is at the heart of a healthy and dynamic culture.

But what is the ideal notion of an ethical publishing system? Such a system should answer to criteria of cost-efficiency, transparency and adaptiveness to the present requirements of scientific communication. In a nutshell, an ethical publishing system should enable every scientist to enter in dialogue on their research processes and results, either with their peers or with the wider society, at minimized entry costs. These criteria have already been extensively discussed in numerous initiatives, which are all compatible with discipline-specific rules of communication and exchange (Wilson, 2018). However, commercial for-profit journals continue to play a huge role in the academic publishing system, dictating the way research is supported and assessed (Stoy et al., 2019).

Many of us are aware of this problem and are willing to move towards a healthier model, but the incentives to keep current publishing practices are strong, especially for young researchers (Tregoning, 2018). Academia, therefore, is facing a collective action problem, in which behaviors that are perceived as beneficial to individuals in the short term end up being detrimental to the community, and ultimately to the public, in the longer term (Hardin 1968). So, are we doomed to passively witness the slow but inexorable degradation of academic publishing? If not, how might we steer a path towards a system that promotes the open and free exchange, evaluation and dissemination of new ideas?

The authors of this manuscript take a realistic but optimistic view. We do not think we are doomed to a publication structure that hurts science and prevents its dissemination while enriching shareholder profits. At the same time, we acknowledge systemic obstacles associated with collective coordination and information sharing. Importantly though, we believe that community-oriented publishing systems are within our grasp: scientists hold the cards to create change, by re-appropriating the ways we publish and evaluate our research output (Logan,

2017). Below, we sketch a path towards this goal. We first lay out some of the main problems with the current system, demystify alleged roadblocks, and set out guidelines that scientists of all backgrounds and career stages can follow, and which can enable the transition to a truly ethical publishing system.

Where are we now?

The scientific publishing system is broken. Over the last 30 years, there has been a massive concentration of journal ownership in the hands of a few major publishing companies: more than 50% of all articles in the natural sciences and the social sciences are currently published by the largest five conglomerates, effectively functioning as an oligopoly (Larivière et al., 2015). This increase in ownership concentration has not translated into obvious benefits for the research community, library systems worldwide, or the public at large (Aczel et al., 2021). While the digitalization of the academic system has led to massive reductions in production costs for publishers, there has not been a corresponding reduction in the price of publication for scientists. Instead, subscription fees have increased considerably across the last decades (Houghton, 2001; Rose-Wiles, 2011), often via journal bundling (Bergstrom et al., 2014). Open-access (OA) schemes were originally proposed as a way to solve this problem. Instead, they have led to increased costs to researchers and scientific institutions, driving journal price hyperinflation (Khoo, 2019).

Largely based on the massive time spent by researchers - for free - in evaluating articles (Aczel et al., 2021), the profit margins of the dominant scientific publishers are currently amongst the highest in the whole industrial market – 37%, 23%, 27%, and 32%, respectively, for Elsevier (2018), Springer-Nature (2018), Wiley journals (2019), and Informa/Taylor & Francis (2019), compared to, e.g., 4%, 8%, 6%, and 5% profit margins for Walmart, Toyota, Exxon, and Amazon, respectively ((Aspesi et al., 2019), www.marketscreener.com, www.macrotrends.net). Against profit margins like these, it is untenable to justify the ongoing dramatic increase in subscription costs and article-processing charges (APCs). This cost burden is not only threatening the day-to-day functioning of library systems (especially in low-income countries, (Nabyonga-Orem et al., 2020)) but also sapping money away from scientific agencies and NGOs (Wood et al., 2021).

Globally, research organizations pay approximately ten times more than is necessary to effect publication. The publishing market is worth about 11.5 billion dollars per year (Johnson et al., 2018) for about 3 million articles published every year (see below). Hence, the current average price of publication is around \$3,000 per article. Yet the effective cost of publication can be as low as \$30 per article (e.g., *Discrete Analysis Journal*), or even \$3 per article (Katz et al., 2019), when scientists voluntarily do the editorial work. The full cost, including the salary of the editorial staff, is estimated to be on the order of \$300-400 per article on average (Alizon, 2018; Grossmann and Brembs, 2021). The total number of scientific articles published every year is somewhere on the order of 2.5 million (size of the Web of Science database in 2018) or 3.5 million (size of the Dimensions database in 2018) (see also (Schimmer et al., 2015)). The overall publication bill should therefore be on the order of 1 billion dollars per year, but research

organizations actually pay roughly 10 times more than this in subscriptions and APCs (Johnson et al., 2018). About a third of this amount is profit for publishers, and about half covers unwanted costs required to support the for-profit system, such as paywalls, lobbying, marketing fees (Grossmann and Brembs, 2021) and million-dollar lawsuits against open access initiatives (Shiermeier, 2017). All in all, academia could save about \$9 billion of public money every year if the publishing system was reformed. This would be a huge saving; enough to cover the salary and research costs of around a hundred thousand scientists across the world, every year.

The cost-dimension linked to subscriptions and APCs - in particular their inflationary trend - can be explained by journal metric-based assessment practices, rather than by the articles' intrinsic quality and impact. The most prestigious journals - which are deemed necessary for career progression - attract subscriptions and APCs, no matter how high. Payments to these journals act as a prestige-rent granted to the dominant publishers, without connection to the actual costs of article editing and dissemination.

Additionally, only well-funded institutions and researchers can afford to pay subscriptions or guarantee the open-access dissemination of their papers. This exacerbates existing inequalities among scientists and the public, generating exclusion. Some publishers offer waivers or discounts for certain countries, but these are insufficient to solve the problem (Nabyonga-Orem et al., 2020). Researchers are segmented between those who can afford the costs - mainly on the base of publicly-funded institutions, predominantly situated in rich countries in the North - and those who cannot afford them, even when applying the same standards of quality in their research processes and outcomes. In turn, publicly-funded scientific results are either kept behind paywalls or only allowed to be disseminated via rent payment to the dominant publishers.

The system also creates a vicious circle by influencing researchers' themselves, and their strategic choices and behaviors. Researchers, subject to the esteem hierarchy (see below), increasingly feel the need to publish a large number of papers in the most prestigious journals they can manage. The inevitable result is a tendency towards minimum publishable units; speed and quantity are prioritized over quality (Hortal et al., 2019). This places yet another (distributed) burden on the research community, as the number of peer review requests mounts, and the number of papers to read and assess becomes insurmountable. In addition, opportunities for innovative, high-cost / high-gain research pathways are deterred (Morais et al., 2021; Saenen et al., 2021; Saenen and Borrell-Damián, 2019; Stoy et al., 2019). Coupled with increased precarization, incentives for competition, quick outcomes and exaggerated claims increase, even in the face of methodological flaws or experimental dead-ends. Ultimately, this creates an environment in which poor research practices and scientific misconduct grows (Sumner et al., 2014). There is, of course, little motivation for the dominant publishers themselves to prevent these practices; they draw very clear benefits from a larger number of papers. More papers make for greater profit and also support brand recognition via metric-based rewards, like citation counts (Silva and Vuong, 2021).

Researchers hence navigate within a system in which their career aspirations are embedded - a system they know to be broken. This leads to paradoxical behaviors: for example, publishing

articles in costly journals for the sake of career advancement, while also praising initiatives like Sci-Hub that illegally grant free access to those same articles (Resnick, 2016). This paradox reveals the crux of the issue. To produce science, scientists need a system where they may freely and openly communicate their processes and results.

Are there alternative systems?

The dominant commercial publishers are clearly not serving the interest of scientists, nor the interests of the public that pay for much of the work scientists do (Aczel et al., 2021). But are there other systems within reach?

The list of alternatives to the oligopolistic commercial journal model is long and diverse, offering a wide choice for scientists heading towards more ethical publishing (see Box 1). This has been facilitated by the practice of uploading manuscripts in preprint servers or open repositories - like *arXiv*, *Zenodo* and *bioRxiv* - which has skyrocketed in the last two decades (Abdill and Blekhman, 2019; N. Fraser et al., 2021; Wang et al., 2020). This has opened up possibilities for subsequent open and transparent review of manuscripts by community members. For example, manuscript-recommendation models like the *Peer Community In (PCI)* initiative (Guillemaud et al., 2019) provide a way for peer review to occur at no cost to reviewers, authors or readers. PCI's associated diamond OA journal - the *Peer Community Journal* - grants acceptance of any manuscript that has been reviewed and recommended in the PCI system. Generally, diamond OA journals (e.g. *SciPost Physics* in physics, *Insights* in scholarly communication, *Discrete Analysis* in mathematics, *Glossa* in linguistics) make content fully available to readers for free, and also ensure there is no cost to the authors for publishing (Fuchs and Sandoval, 2013).

Some desirable features for academics and the public are also found in a number of paid-for non-profit OA journals, such as *eLife* and the *Public Library of Science (PLOS)*. However, this type of journals can lead some resources invested for publishing research to exit the research domain, though not at the scale of or via the same mechanisms as for-profit journals (Box 1). Even though they might technically be non-profit, paid-for non-profit journals can still be controlled by a profit motive, because the number of employees and the size of their salaries depend on the turnover of the publishing organization. Ultimately, high costs due to marketing and management salaries may be imposed on researchers and research institutions via high APCs (Logan, 2017). In contrast, diamond OA journals explicitly set APCs to zero, preventing such leakage of research funds away from the research domain.

A third - more traditional - publishing option is that of society journals, which often call the services of a for-profit publisher, so that publication fees are only in part reinvested in academia. Nevertheless, society journals are controlled by well-established and well-connected communities of scientists, with a strong investment in each individual field, and a long history of promoting and diffusing science (Schloss et al., 2017). Thus, they have a great potential to play a major role in the transition towards more ethical publishing (Phillips, 2019).

How can we best inform ourselves about the different publishing models and how they prioritize ethical publishing practices? Some initiatives exist to guide scientists and provide valuable

information. For example, in the field of ecology and evolutionary biology, DAFNEE (<https://dafnee.isem-evolution.fr>) is a database of academia-friendly journals intended to inform scientists about their economic models, publication fees and partnerships. DAFNEE only includes journals owned or controlled by public institutions, non-profit organizations or groups of scientists such as learned societies. Some of these organizations partner with for-profit publishers, while others are entirely non-profit and/or non-commercial. They can be queried by topic, economic model, academic partnership, publication fees and impact factor, among other variables.

BOX 1 - The multidimensional landscape of academic publishing

The academic publishing landscape is not simple, and a single dimension is far from enough to capture the complexity of different journal models. From an economic point of view, journals can be held by commercial companies (e.g., Elsevier, Nature Springer, Wiley), by non-profit commercial (e.g., *PLOS*, *eLife*) or by non-commercial (e.g. the SciPost Foundation) organizations. Hence, a society journal may be non-commercial or run by a for-profit company, with none, part or some of its profits re-circulating back into academia. Non-profit commercial journals may have high, low or no subscriptions fees or APCs, depending on how much cost it considers necessary to operate in the long-run. Among the different criteria one could use to classify journal models, we here focus on two that we believe are particularly important: “openness” and “economic model”. Together, they define a two-dimensional matrix (Figure 1) which allows us to visualize the pros, cons and trade-offs of different journals along these axes:

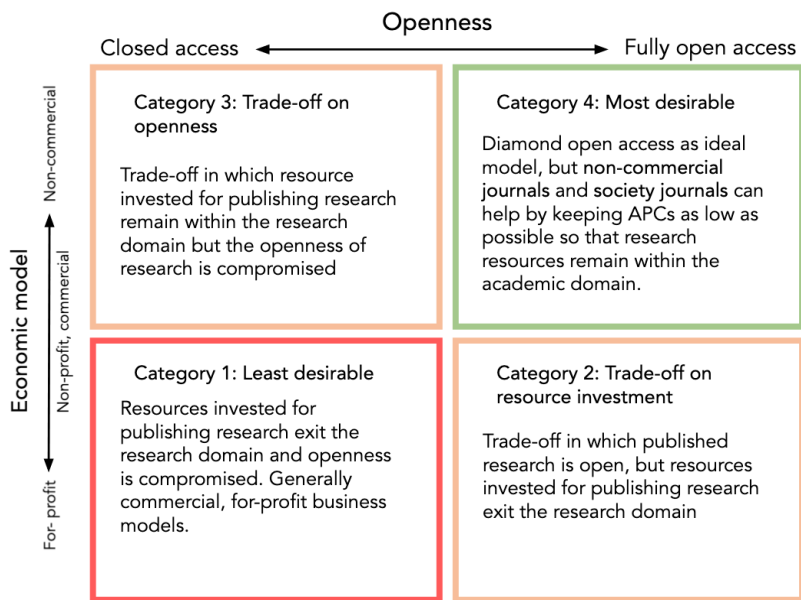


Figure 1. Two of the dimensions of the publishing landscape: openness and economic model.

In the bottom-left corner of the matrix (category 1), we find for-profit, commercial, closed-access journals. Many of them can be qualified as hybrid journals: authors must pay APCs to publish their article in OA, and the journals also profit from placing paywalls that block access to those who cannot afford to pay to read. This is the least desirable model, and the motivation for publishing in them is

generally driven by the esteem hierarchy, which commercial journals encourage and exploit (see main text).

In the bottom-right corner (category 2), we find a trade-off on resource investment with commercial journals publishing all their content in OA - often referred to as Gold OA journals - but charging authors with (sometimes very expensive) APCs. The vast majority of OA journals - including some society journals run by for-profit publishers and some non-profit commercial journals with high salaries and marketing costs - fall into this category.

In the top-left corner (category 3), we find a different kind of trade-off. These are commercial journals that might not be for-profit and might not charge authors, but still restrict access to articles: readers have to pay or be subscribed by their institutions to access the content of the articles. Members of the public without resources or an institution to pay for the costs are generally left without access as well.

Finally, in the top-right corner (category 4), we find the most desirable type of model. Non-commercial journals that publish all articles in OA. In ideal cases, they publish articles without APCs for authors (these are called diamond OA journals). They are directly supported by institutions that cover their running costs through financial and in-kind donations, maximizing both openness and re-circulation of resources back into academia. Though diamond OA is more desirable than categories 1, 2 and 3, we note that non-profit commercial OA journals with reasonable, cost-reflective APCs (somewhere between category 4 and category 2) may play a beneficial role in the long-term, by guaranteeing diversity in the publishing ecosystem.

We note, though, that distinctions along these two dimensions do not cover the full complexity of the publishing landscape. For example, journals with the same business model might have differences in ownership models (Figure 2), ranging from society, community or non-profit actors to commercial enterprises. This and other considerations not discussed here might also be important when choosing where to publish.

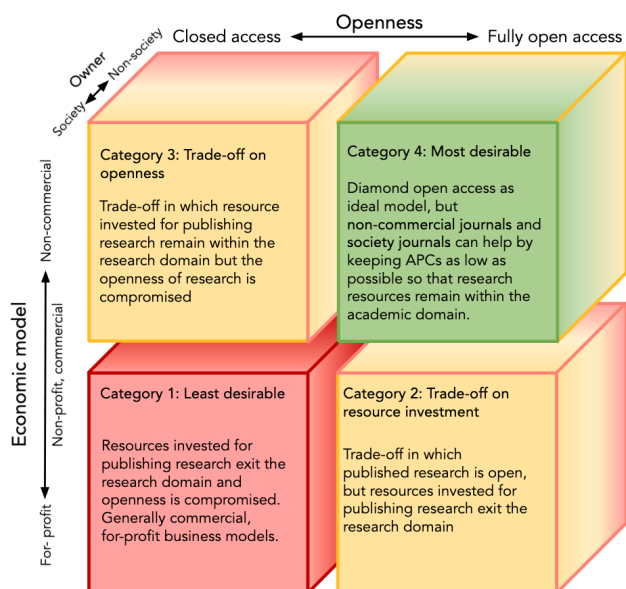


Figure 2. Incorporating a third dimension (ownership) into the publishing landscape matrix.

Why haven't we already transitioned to alternatives?

Before proposing ways towards healthier alternatives, like diamond OA, it is important to recognize that the for-profit academic publishing system is a stable one, and is difficult to perturb (Allahar, 2021; Ponte et al., 2017; Schimmer et al., 2015). Academic publishing companies have, like any other company, worked to promote and secure their business model. They have effectively exploited a growing trend of metric-based evaluation among researchers, by marketing and lobbying for attaching esteem and perceived objectivity to these metrics. Researchers came to believe that some journals are better than others, and so professional esteem is attached to publishing in some journals instead of others. This “esteem hierarchy” is a fiction come true: the belief that it is true is enough to make it true.

The esteem hierarchy is also pernicious. Colleagues on grant panels and promotion committees use it as a shorthand when assessing applications. Rewards flow to the individual that publishes high on the journal esteem hierarchy, regardless of the quality of that individual's work. Through their over-reliance on publication metrics, scientific institutions effectively entrust scientific output evaluation to metrics created in a commercial mindset without direct consideration for scientific merit (Johnston, 2015). A logical consequence of the esteem hierarchy is that researchers compete for limited places in what they perceive to be the best journals. With limited supply and lots of demand, price inflation is a natural consequence of this runaway process.

Thus, the esteem hierarchy underpins the difficulty of transitioning to alternative models. Any new model faces an uphill battle against larger and older competitors, who hold all the cards. Any researcher publishing with a new, low-APC, ethical journal pays the opportunity cost of esteem points.

On top of this, researchers are generally unaware of the cost of accessing the literature, including costs paid via institutional subscriptions. In fact, dominant publishers often keep institutional subscription costs under non-disclosure agreements, leaving not only researchers and research institutions in the dark about costs, but enabling publishers to raise prices without scrutiny (Bergstrom, 2014). Subscription prices have become more transparent in recent years, but access to literature and publication fees are still often considered infrastructure costs or covered by institutional budgets. Therefore, the incentive to publish high in the esteem hierarchy cannot be counterbalanced by concerns about the dominant publishers' pricing, despite the exorbitant cost absorbed by libraries and research institutions, which is quickly becoming unsustainable under the status-quo (Resnick and Belluz, 2019).

This is a very clear case in which what the individual perceives to be a short-term good is at odds with the long-term good of the scientific community, and humanity as a whole (Casadevall and Fang, 2014). To resolve this conflict, we need to find pathways that align the interests of the individual with those of the community, and that work to erode the esteem hierarchy that prevents alternative systems from becoming widespread.

What can we do?

Below, we list a set of suggested actions we can undertake as academics, at little to no personal cost to career prospects, in order to pull publishing away from the hands of the dominant commercial publishers and back into the control of scientists, while eroding the esteem hierarchy that commercial actors have encouraged over decades.

1. Recognize our specific leadership roles and leverage points

The academic system has clear hierarchies, which constrain the range of actions one can undertake. We recognize that differences in funding, seniority, cultural and academic background, gender and ethnicity shape our capacity, energy and time to enact change. We also recognize that those with the largest amount of power have the highest responsibility to enable this change. Yet, we can all contribute in different ways from our different positions, once we identify the leverage points that are within our reach: essentially, the people who engage with us regularly and are willing to listen to what we have to say. As a PhD student, that could mean one's supervisor or advisor, fellow lab members, or members of a student union. As a member of a grant review board, it could mean other reviewers or grant agency officers. As a member of a scientific society, it could mean fellow members or society officers.

2. Let people know our concerns

The current perceived dependence on commercial journals is a collective action problem: all academic actors would be better off if they cooperated, but fail to do so because of perceived competition among us. A way to begin to defuse the social dilemma is by sharing information: letting our peers, advisors, mentors and mentees know that we disagree with the system, even if we feel constrained to operate within it. As a student, that can mean engaging in conversations about past and future publishing choices for joint work with our supervisor or fellow lab members, especially before a research project begins. As a member of a grant review board, it can mean openly talking to fellow reviewers about the problems with evaluation metrics reliant on prestige derived from for-profit publishing. As an officer in a scientific society, it can involve calling for a re-evaluation of the methods the society uses for publication outlets. As an author of a study, it can mean raising awareness among co-authors of problems with commercial publications, and taking this dimension into account when choosing a journal to publish in. Social media can help to highlight papers published in ethical venues, as well as problems tied to commercial publishing systems. When talking about for-profit journals, we can also use words one would associate with negative feelings / behavior ("exploitative", "profiteering") rather than positive feelings / behavior ("impact", "authoritative", "top").

At the same time, we should keep in mind that all academics are embedded in our current system and should not be ridiculed for trying to preserve their careers (but see Box 2 for a demystification of the perceived "costs" of publishing in non-profit journals). All of these conversations will be most effective if approached with honesty and good faith, avoiding shaming, blaming or antagonizing the other party, or raising unsubstantiated statements about publishing (see Box 3 for a guide to debunk false claims during such conversations).

Ultimately, the onus lies on the major sources of academic funding. If we have access to officers of public research institutions, funding agencies, negotiation consortiums and learned societies (or know someone who might), it is crucial to engage in conversation with them, and explain the problems with the for-profit publishing system, without assuming that knowledge about it is widely disseminated

3. *Engage in collective action*

Leverage points can become clearer or more approachable if we act collectively. An academic union or a student organization can influence policy better than a single individual. Collective action works because of the power of social signaling: people are more willing to act if they know others are committed to act in unison. Social “tipping points” (reviewed in (Lenton, 2020)) can thus rapidly shift the structure of a system, if enough information flows between relevant actors. There are already declarations of non-collaboration with closed-science publishing practices (e.g., <https://nofreeviewnoreview.org/>), but these do not yet take into account the dumping of OA “rents” on academic researchers and institutions. Other collective initiatives such as the San Francisco Declaration on Research Assessments (DORA) have brought individuals together to denounce the misuse of journal metrics, which drive the aforementioned esteem hierarchy. Similar initiatives could emerge against commercial journals, by collecting declarations of support from scientists *en masse*. A public statement in favor of ethical, non-profit publishing or peer review systems by a large academic organization can help frame the conversation in a positive direction, and steer others to modify their behavior.

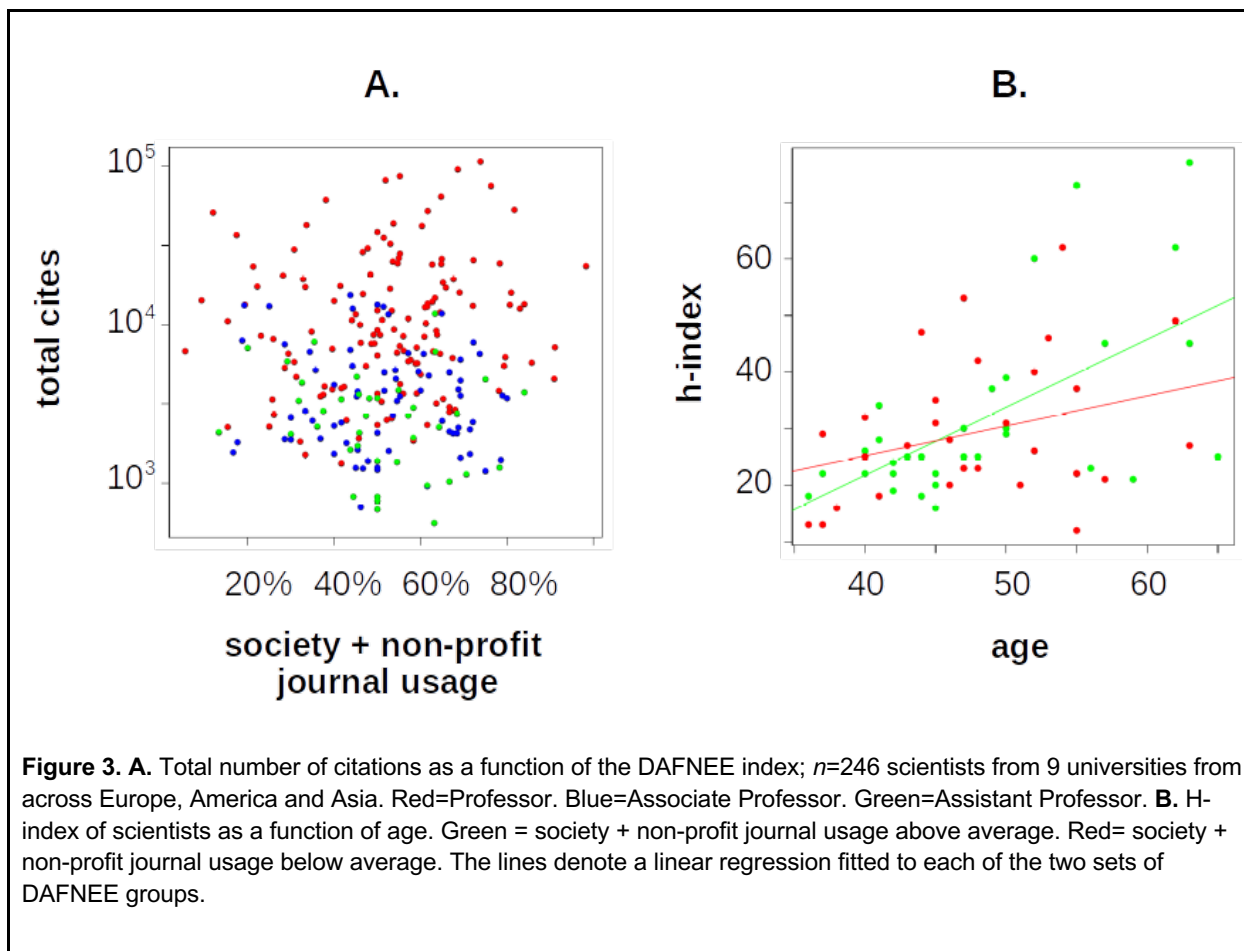
As we engage in such efforts, we should keep a systemic viewpoint in mind: collective action should not only target publishing practices, but also the journal metric evaluation schemes that fuel them. Researchers should reach out to contacts in funding agencies, public representatives and university administrators, many of which already share their same concerns (CIHR et al., 2019; European Commission, 2022, 2017; European University Association, 2022; C. Fraser et al., 2021; Science Europe, 2021, 2013; Science Europe and European University Association, 2019; Wellcome, 2020; Wilsdon, 2016), thus strengthening the leverage we all have to propose and implement changes in research assessment. For example, this can be done by engaging with our student and early career researcher representatives, and encouraging them to connect to organizations advocating for change on a national and supranational scale (Berezko et al., 2021; Hnatkova et al., 2020). We can also formalize our support for existing collective actions that pledge for more ethical publishing: e.g., signing DORA, the Jussieu call (Bauin et al., 2017) or the Leiden Manifesto (Hicks et al., 2015). Finally, we can increase collective leverage by changing our own practices, for example when assessing peers and when judging the quality of scientific papers (see recommendation 7 below). Connecting advocacy of all concerned stakeholders may increase the pace of transition in evaluation and publishing practices.

BOX 2 - Is there a “cost” to faculty publishing in non-profit or society journals?

It is often suggested that publishing in commercial journals is beneficial to a scientist's career. We assessed the validity of this claim in the field of Ecology and Evolutionary Biology by querying the DAFNEE database, which contains publishing information for this field. We sampled nine cities/states having recently hosted a major conference in this field: the Joint Evolution meeting (Society for the Study of Evolution, European Society for Evolutionary Biology, Society of Systematic Biologists, American Society of Naturalists) or the SMBE meeting (Society for Molecular Biology and Evolution). These were located in cities across three continents: Austin, Ottawa, Québec (America), Auckland, Queensland, Tokyo (Asia), Manchester, Montpellier, Vienna (Europe). In each of these cities, a department of ecology, evolutionary biology or biology was identified. The name, surname, and academic position of faculties were retrieved from department web sites. For each scientist, the following statistics were collected: total number of citations in career, h-index and DAFNEE index. The h-index (Hirsch 2005) is the number of articles of a scientist cited at least this number of times. The DAFNEE index is the proportion of a scientist's articles published in society or non-profit journals. The total number of citations and h-index were manually retrieved from Google Scholar. The DAFNEE index was automatically calculated based on PubMed records and DAFNEE journal annotations. Scientists having published 10 articles or less in journals surveyed by the DAFNEE curators were not included.

A correlation analysis did not reveal a significant relationship between total cites and DAFNEE index ($n=246$, $r^2=0.0025$, $P > 0.05$; Figure 3.A), or between h-index and DAFNEE-index ($n=246$, $r^2=0.0037$, $P > 0.05$). Adding scientists' gender, academic position and city/state as co-variables did not reveal any hidden relationship between citation metrics and the DAFNEE index. In one department (Institut des Sciences de l'Evolution de Montpellier) we could access scientists' age and expand the data set by considering all of the scientists' publications instead of just PubMed records. Figure 3.B plots h-index as a function of age in this department, with green dots corresponding to scientists with a DAFNEE index above the median, and red dots corresponding to scientists below the median. The two regression lines did not differ significantly (covariance analysis, $n=62$). These analyses suggest that to favor society/non-profit journals over purely commercial journals has no negative impact on the citation rate of faculty members.

The results above are perhaps not so surprising; indeed, both compared sets of journals, society/non-profit vs. purely commercial, are highly heterogeneous. Many society journals are known for having a long history of publishing high-quality science, and a number of non-profit, OA journals are quite selective; one can clearly build a very solid CV while favoring these. This encouraging result should not hide the fact that many society/nonprofit journals have excessive subscription fees or APC's, which are only partly re-injected in academia, and/or do not offer OA to their contents (see main text and Box 1). The results may likely apply to other scientists as well (PhD students, post-docs) since they imply that articles published in academia-friendly journals are not less cited than articles published in purely-commercial journals.



4. Withdraw our free peer review or editing labor from commercial journals.

Increasingly, researchers are beginning to openly deny requests for peer review or editing from the dominant commercial publishers. This is a low-cost, high-benefit action that can have high impact, especially if done openly and transparently. There are few (if any) repercussions flowing from systematically denying one's labor to a confidential and private request to give labor away to a for-profit company. Importantly, we can let both the journal's contact person and our peers know why we're doing this (anonymizing the author names and article title to preserve confidentiality), and use it as an opportunity to question the assumptions behind the request. We can stress that the reasons are not necessarily about our own personal money or time per se (thought they might be), but about the nature of the for-profit system in general.

In response to the profiteering model of academic publishing, it has occasionally been suggested that reviewers be paid for their work. We do not believe that it is a good idea. First, the cost of peer review would simply be passed on to the community. Second, any payment would be unlikely to reflect the true value of the time and expertise of the reviewer, so researchers would essentially be de-valuing their expertise - turning a pro bono contribution into an underpaid commercial activity. Finally, the introduction of payment for review can only reinforce the esteem hierarchy: dominant for-profit publishers have much greater financial

resources than non-commercial publishers, so can afford to pay more and, in return, charge higher APCs or subscription fees. If they were to begin paying reviewers (even small amounts), the system would work against the non-profit or society publishing organizations that rely on the good will and trust built over years of engagement between academics. Thus, payment requests for peer review could run the risk of driving good actors out of the system. Instead, research institutions should more openly recognize peer review as an integral part of researchers' work, adapting research assessments to explicitly consider peer review as an important academic contribution.

5. Support healthy journals

When deciding where to submit a paper, scientists normally aim at reaching the widest possible audience. The set of potential target journals is typically chosen based on a combination of impact factor and thematic relevance. We suggest adding the journal's business model, and more generally, the journal's publication ethics, as an additional criterion. Indeed, our submission choices can have a strong impact on the structure of the publishing system (Logan, 2017). Whenever we have a choice between more or less equivalent options, we can favor diamond, non-profit and/or society journals over purely commercial journals. By doing so, we will retain (part of) the publication fees in academia, support the groups of scientists who run these journals, and strengthen their power to negotiate with private publishers, if they use their service. For example, roughly 50% of the articles in the field of ecology and evolution currently appear in journals that are not purely commercial (see Box 2). Increasing this percentage up to, say, 70% would entail no strong disruption of scientists' habits, while having a huge impact on the regulation of the overall publishing market.

Some large institutions have already engaged in the creation or support of diamond OA journals (Becerril, Arianna et al., 2021; Bosman et al., 2021) or publishers of such journals (e.g. SciPost). However, this trend remains scarce, the financial efforts are limited and these journals often have a limited audience. It is important for large institutions to be more ambitious and create or support general or specialized diamond journals of high reputation: e.g. a "Max Planck Journal of Solar Physics", a "Stanford Journal of Genetics", a "Tokyo University Journal of Asian History", or a "Wellcome Trust Journal of Medicine" (Haspelmath, 2015).

We can also support a healthy publication system by providing peer review and editorial support to existing non-profit journals - fulfilling roles like associate editor, for example, and stepping out of such roles when they serve dominant for-profit publishers. Indeed, volunteering is mentioned as a challenge by many diamond OA journals "*who expressed concerns about the reliance on the goodwill of volunteers and on the dedication of certain individuals who sustain journals who cannot be necessarily relied upon in the mid- to long-term*" (Becerril, Arianna et al., 2021). Hence, a more substantial commitment to running those journals is essential if we want them to play a significant role in the publishing landscape. Expanding initiatives like DAFNEE to other fields could also help inform authors of the hidden benefits (to both the individual and the community) of publishing in these journals. Research teams may meaningfully mobilize tools designed by librarians to help them reflect and reach a decision in the choices of OA journal. An

example of this is the Publication Strategy and Open Science tool (<https://tinyurl.com/publishing-strategy>), developed by Jeroen Bosman and Bianca Cramer.

6. Discuss switching to ethical publishing with existing journal owners

Many journals are owned by scholarly societies or research institutions (national research institutes, universities, laboratories) but are published by dominant commercial publishers. Publication or subscription fees end up partly in the hands of the publisher and partly contribute to the research institution's or scholarly society's budget, in a generally unknown proportion. The budget of learned societies comes partly from this return from the private publisher, partly from subscriptions from the members of the association, and sometimes from donations from funding agencies or research institutions. In all these cases, 100% of these budgets actually and originally come from the scientific community (the scientists themselves, the research institutions and the laboratories). Indeed, subscriptions, APCs, memberships and donations all come from the academic community, and yet a substantial proportion does not return to the community, but rather ends up in the pockets of publisher shareholders, or covers costs unlinked to the publication itself (marketing and lobbying) (Grossmann and Brembs, 2021).

Convincing scholarly societies or research institutions to give up their association with large commercial conglomerates would be a way to end this pointless “bleed-out” of academic funds (Haspelmath, 2015; Wilson, 2018). Such organizations could begin by making profit-sharing arrangements explicitly, which could in turn prompt their members to support a switch to ethical or non-profit publishers, or even organize the publication of their journals themselves in a fair open access model (www.fairopenaccess.org). Several journals formerly published by dominant commercial publishers have already pioneered this type of switch. For example, the whole editorial board of *Journal of Algebraic Combinatorics* resigned from Springer in 2017 and set up *Algebraic Combinatorics* (algebraic-combinatorics.org), a new journal based at Centre Mersenne. Similarly, the editorial board of *Lingua* decided to quit Elsevier in 2015 and founded *Glossa*, a journal published by Ubiquity Press (Wilson, 2018).

Such a switch would mean that the income of learned societies would come less or not at all from the payment of part of the subscriptions or APCs by dominant commercial publishers. They would have to make up for this loss of income by obtaining direct grants from funding agencies or research institutions, or running their journals in autonomy, while keeping APCs on the order of the real publishing cost. For the learned societies, this switch would make little difference. For the scientific community as a whole, it would generate considerable savings. Indeed, funding agencies and research institutions would gain substantially, because 100% of their direct grants to learned societies would actually benefit the scientific community (budget of learned societies and real cost of publications) and publication costs would be kept to a minimum.

How can we convince learned societies and research institutions to switch? This can be done by proposing this idea as a point of discussion during general assemblies, by discussing directly with the teams in charge of learned societies or research institutions, or by talking to the editorial teams of journals. Associations specialized in this approach exist in numerous fields: LingOA in linguistics, MathOA in mathematics, and more generally the Free Journal Network

and the Fair Open Access Alliance. They promote the fair access model, help journals to switch towards fair access and help them to maintain this model. For instance, the switch performed by the editorial board of the Journal of Algebraic Combinatorics has been assisted by MathOA. In turn, LingOA has helped four journals to switch to fair OA: the journals *Glossa*, *Laboratory Phonology*, the *Italian Journal of Linguistics*, and the *Journal of Portuguese Linguistics* (www.lingoa.eu/new-mission).

7. Promote ethical behavior by focusing on science, not journal names

We can also promote ethical behavior in our daily academic duties. We can avoid evaluating any colleague in hiring/promotion committees based on bibliometric data alone, and reject requests to sit in an evaluation committee unless we are given sufficient time to make a qualitative assessment of applicants' research based on the content of their research output. We can encourage our colleagues to cite papers based on merit and not necessarily because it is published in an esteemed journal. Similarly, we can encourage researchers to regularly check society and non-commercial journals. When informally discussing a paper (e.g., in journal clubs), we can steer conversations away from "where" the article was published, to better focus on the content of the article.

When performing research, we can aim to uphold ethical standards for data openness, responsibility and accessibility from the start of the research process, e.g. by using the FAIR principles for data management and stewardship (Wilkinson et al., 2016) and the CARE principles for indigenous data governance (Carroll et al., 2021). We can also think critically about how the choice of a particular journal for submission might affect our ability to maintain such principles.

Recently, major changes in the procedures for project evaluation by funding agencies have resulted in a move away from simply counting articles. Many agencies are starting to require narratives and indications of societal impact: researchers can help move this forward by expressing public support for these moves. For example, the University of Utrecht announced that it was abandoning the use of impact factors for the promotion and recruitment of its scientists (Woolston, 2021) in favor of evaluations based on "qualitative measures, narrative and strategy first" (Utrecht University, 2021). At the 2022 Paris Open Science European Conference (OSEC), Maria Leptin, the current president of the European Research Council (ERC), said that, having signed DORA, the ERC has completely banned the use of impact factors and that its panels should rather look at the content of the proposed projects (ERC, 2021). The National Health and Medical Research Council in Australia recently switched to evaluating track records based only on a researcher's best ten papers of the last ten years, prompting applicants for narratives to justify their choice of "best" (NHMRC, 2022). Similarly, at the Centre National de la Recherche Scientifique (CNRS) in France, individual evaluation committees are abandoning impact factors in favor of narratives and qualitative explanations of researchers' contributions to the advancement of knowledge (Larousserie, 2021). Indeed, Sylvie Rousset, head of open science at CNRS recently stated that "*We are working to stop delegating the scientific evaluation of researchers to the editors of journals, however prestigious they may be*" (CNRS, 2021). CNRS now requires the evaluation of researchers to be based on: i) the

results themselves and not the fact that they may have been published in a prestigious journal, ii) a limited number of such results, and iii) a larger diversity of professional activities - including preprints, data sharing, software production, training, innovation, management and investment in open science, among other criteria. Similar approaches have been taken up across Europe: for example, the UK Research and Innovation (UKRI), the Dutch National Research Council, the Swiss National Science Foundation, the Luxembourg Research Council, and the Health Research Board Ireland have all started implementing and discussing the strengths and challenges in the implementation of “narrative CVs” (Hazlett, 2021).

BOX 3 - Debunking publication myths

We often encounter false or unsubstantiated claims related to ethical publishing in our daily research practices. Here, we provide a short guide to debunk these claims when engaging in conversations with other members of our communities or research environments.

“All recognized journals in my field are unethical”

Many recognized journals are owned by learned societies or research institutions, whose members work to keep scientific resources within science. In ecology and evolution, this proportion amounts to about 50% (cf. dafnee.org)

“I will be less cited if I publish in an ethical journal”

See Box 2 for a demystification of this claim.

“I cannot publish in an ethical journal because my supervisor does not want to”

If you are a student or postdoc, it is always worth discussing publishing choices with your supervisor: you may be surprised. Research supervisors often use the opposite argument to justify themselves: “I cannot publish in an ethical journal because students and postdocs are signatories to the article and this could harm their career”

“I cannot publish in an ethical journal because students and postdocs are signatories to the article and this could harm their career”

Students and postdocs are often the most highly motivated to publish in ethical journals. They might use the opposite argument to explain why they do not publish in ethical journals: “I cannot publish in an ethical journal because my supervisor does not want to”. If you are a supervisor, it is worth discussing publishing choices with your students and postdocs, especially at the beginning of a research project. See also Box 2.

“I have no leverage over unethical journals”

There are many ways in which we can exert leverage over the publishing system and the choices other scientists make. This include but are not limited to:

- a) Refusing to review or be an editor for these journals
- b) Choosing other journals for publication
- c) Discussing with members of editorial boards about switching publishers
- d) Discussing with members of learned societies about abandoning contracts with dominant commercial publishers

“Evaluation committees always use journals as indicators of quality”

Many review boards are increasingly using qualitative assessments and abandoning the use of journal metrics as a proxy for research quality. The number of DORA signatories bears witness to this. Additionally, the members of evaluation committees are also researchers. We can argue for increased use of this type of assessments, and refuse to sit on commissions that operate unethically.

“We will have to deal with the same system forever. Nothing will change”

The publishing system is changing, and we can accelerate such a change. Every year, there are more and more DORA signatories. Impact factors are now banned from a growing number of evaluation committees. There are also international initiatives created to change the research evaluation procedures, e.g. the Paris Call on research assessment (OSEC, 2022) based on the European Commission report on a reform of the research assessment process (European Commission, 2021).

Conclusion

The scientific publishing system is now at a crossroads. The increasing strain caused by dominant commercial publishers on library systems, research institutions and the public at large is untenable, and is pushing many scientists to reconsider their preferred choices for publication. Yet, it is up to scientists themselves to create actual alternatives that pave the way forward.

Thankfully, many such alternatives are emerging, including diamond OA journals and community peer review initiatives with no cost to reviewers, authors or readers of scientific output. The possibility to transition to ethical, low-cost alternatives is still within our power. Making the transition will naturally require leadership and thoughtful engagement by researchers, their professional societies, institutions and funding agencies. The benefit of this collective action would, however, be profound. Not only would it remove a massive cost burden from research institutions, but also make the global research enterprise more efficient, equitable, and accessible. What is stopping us?

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Data and script availability

The anonymized bibliometric data and R scripts used to generate Figure 3 are available from: <https://osf.io/az5rh/>

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TG and DB are co-founders of PCI and members of ESEB and SFE². FR is a member of the managing board of *PCI Evol Biol* and a member of SMBE. NG is a recommender for *PCI Evol Biol* and a curator of the DAFNEE database.

Contributions

FR, NG, TG and DB initially conceived the idea for the manuscript. FR, NG, TG, DB and VDH wrote the first version of the manuscript. FR, NG, TG, DB, NAB, VDH and BP reviewed and edited the manuscript. NG performed the database analyses of Box 2. NAB created the schematics in Box 1.

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