AND DATA SCIENCES
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The path toward ethical science is paved with diamonds

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Over the last two decades awareness of a Reproducibility Crisis penetrated all scientific disciplines. Studies recently showed that 90% of scientists in STEM and 95% in psychology were aware of this Crisis [1, 2]. At its core this is a crisis of trust. The findings scientists publish and tout as facts, are often not replicable by others. Moreover, a great many are not even computationally reproducible using the original data [3, 4]. The Open Science (OS) Movement is the counterpart to this Crisis [5, 6]. Especially over the last two decades, researchers organized grassroots movements to make science more transparent, reliable and ethical.

One of the many tenets of the OS Movement is open access. Published research results must be accessible to everyone. This is not a new idea. In the 1940s Robert K. Merton claimed that all scientific findings should be public property [7]. He argued that sustainable and efficient progress of science depends on everyone being able to use all available information on a given subject. In data science the OS Movement manifests in "Open Science by Design" – a strategy where scientists plan in advance how they will make all metadata, data and algorithms available and easily re-usable by anyone [8].

The OS Movement has been successful. Open access journals and articles increased rapidly; outpacing the global increase in publications in other formats in the last two decades [9]. One problem is that these open access articles are overwhelmingly funded by the scientists who produced them via Author Processing Charges (APCs). It costs over 10 thousand US$ to publish a study open access in the journal Nature, and most other journals charge between two and five thousand. Except for elite institutes and projects with generous third-party funding, these fees are not covered nor coverable. A naïve outsider might ask: why would scientists pay astronomical fees to make their own hard work publicly available, when they can simply share it online in a free repository like the Open Science Framework, Github or any number of preprint servers based on the ArXiv model?

The answer is competition. The strongest norm governing the practice of science today is publish-or-perish. In every field and science at large, scientists are judged based on their publication record. Ask any academic what the top journals in their area are, and you will get relatively consistent answers by discipline and sub-field [10]. Look at the faculty of any 'top' university, and the faculty in any discipline will have one or more publications in that discipline's 'top' journals. Without publications in these journals, a scientist has no chance at a career in science. This is a collective cultural fact. One deeply institutionalized in the organizations, rules, norms, expectations and behaviors of scientists [11, 12].

Thus, the founding of new open access journals with lower APCs has little impact on the scientific enterprise, because they cannot compete with institutionalized legacy statuses of existing journals. The greatest success story is the non-profit publisher PLOS, which rose swiftly in subjective and objective metrics, but could not crack into the very top tier. Although far cheaper than Nature, its journals are still not 'cheap', with APCs ranging from 2.5 to 3.2 thousand $US . The most successful

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open access models are existing paywalled journals where authors have the option to publish "gold" open access, rather than publish for free and give away their copyright. The payment of somewhere between two and 10 thousand US$, gets authors the right to have their single article published open access inside of a closed access journal. This means that despite a massive shift toward open access, the fundamental structures of scientific publishing as a profit-driven and -controlled activity have not changed.

Ethical Implications

Competition in science supports motivation and innovation, but the publish-or-perish norm is a toxic externality. Scientists willingly prioritize subjective journal ranking, impact factor and increasing their citation counts to get ahead within the competitive scientific enterprise. They do this despite widespread skepticism and evidence that rankings and citations do not correlate strongly with the quality and reliability of published studies [13–15]. They do this because they must, or at least perceive that they must, in order to follow their scientific career aspirations. The pressure to publish thus motivates rent-seeking behaviors designed to increase publication chances, i.e., career chances. And many of these methods to increase publication chances are unscientific, what are known today as questionable research practices (QRPs) [16, 17].

Some QRPs are unconscious and learned from supervisors in the process of converting research into a publishable paper. For example, researchers routinely run many statistical models but report only those that show the strongest support of their claims. Researchers who believe that their claim is true in the first place will gravitate toward models that support it, convincing themselves intrinsically that these models are the best tests of their claim. Researchers also play around with data and come to an interesting finding, which they then write a paper designed to predict in the first place – thus falsely signaling that their research is confirmatory when it is exploratory.

Decisions based on confirming intrinsic beliefs or window dressing for peer reviewers reduce the replicability of science. They narrow down the multiverse of potential findings into a highly selected set of results. This selectivity is independent of the process that generated the data in the first place, in other words, it is science orthogonal. A classic example is a study published suggesting that hurricanes with feminine names cause more damage than those with masculine names. It turns out that using the available data, the original researchers selected a model that produced regression coefficients extremely far away from the central tendency among all other plausible models' regression coefficients [18]. We do not know whether this was a conscious decision, but their reporting hid the truth and simultaneously increased publication chances.

There are of course conscious and highly unethical behaviors leading to an entirely false representation of reality. Science is filled with scandals of hacking and data-faking. Rent-seeking alone can explain unethical learned unconscious and conscious behaviors of scientists. They seek status and money and job security, or in some cases seek results that support a particular worldview or policy outcome [19, 20]. But rent-seeking is unambiguously the main reason [21, 22].

If we as a scientific community and science-interested public, want to eliminate the perverse incentive structures that bound and inform rent-seeking behaviors of scientists we need radical change. Status should not be assigned based on journal metrics that often have little to do with the quality of the research and more to do with legacy and embedded norms. The most radical proposal is to eliminate journals altogether. But this is an extremely unlikely outcome no matter how powerful the

OS Movement becomes.

Journals became standard in science hundreds of years ago as a means for communicating scientific discoveries across time and space [23]. They enabled scientists to acquire knowledge without travelling to faraway universities. Publishing was not cheap, and with the dawn of digital media, it became even more expensive as publishers raced to provide their journal both in-print and online. The costs associated with publishing along with a rapidly expanding global scientific enterprise gave publishing firms a great deal of power over time.

The result is that companies like Springer Nature and Elsevier have enough power to dictate to scientists how they perform their research and communicate their results [24]. They shape academic careers, institutional priorities, governments' science policies, and perceptions of journals and the publishing enterprise among scientists [25]. Their primary legal interest is their shareholders. Profit is their priority, and only second is to provide a service to science as a consumable product. A simple mathematical proof confirms that profit is their priority: If they cannot make a profit, they will no longer provide the scientific services. If they can make a profit without providing scientific services they have no reason to stop.

Although big publishing firms have shown many draconian practices in their 'service' to science [26–29], scientists still need a means to communicate their results with each other and the public. This can be done without for-profit publishing but probably not without a journal publication format, or something very similar. For example, we now have a plethora of 'green' open access preprint servers where scholars can deposit working papers, or prior versions of their published articles. These are viable means to communicate science without the perverse incentives generated by big publishing or institutionalized journal rankings. But this all still involves the journal article as the standard unit of science.

Diamond Open Access

If we are 'stuck' with journals in science as our primary communication medium, then they should be as free from perversely incentivized bias as much as possible. The first step is thus to remove the influence that for-profit publishers have on the process and outcomes of science. It is fine to use the services of for-profit publishers. They have shown the capacity to provide print on demand, marketing and scientific journalism. But when they control and direct the scientific enterprise it is an ethical conflict of interest – namely profit-seeking versus robust science.

The costs of publishing a journal are the lowest in history. There are publication kits that help associations, institutions and stand-alone journals to take publication into their own hands [30]. With minimal costs and self-governance, scientist controlled journals would have no need to push institutions to purchase journal subscriptions and no need to charge authors astronomical publication fees. Thus, they themselves are not perversely incentivized to perpetually increase their status to make their product profitable.

The optimal existing solution is diamond open access, whereby a journal charges no APCs and is freely readable and downloadable online [31]. It is the most ethical and equitable by design, and is perceived as the ideal model by most academics [32]. The OS Movement is overwhelmingly in favor of diamond open access33, as are governance bodies – at least those free from the influence of big publishing like UNESCO [34, 35].

Successful diamond open access is rare. Despite 13 thousand journals indexed in the Directory of

Open Access Journals (DOAJ) with no fees as of February 16th, 2026, these journals are not on the radar of most indexing services, and do not belong to the mainstream of journals published by major scientific societies [36]. Because of such a saturated scientific 'market' for publication outlets, starting new diamond open access journals has had little impact on making science more ethical. They do not gain reputation. The reason PLOS was so successful, despite failing to break into the highest echelon of science, was because it has a huge cash flow and can use it for branding and promotion. From an ethical science perspective it is valuable, like gold, but it is not as valuable as diamond.

Flipping or Starting Over?

To have the highest ranking and most well-known journals diamond open access, societies need to cancel their contracts with for-profit publishers [37]. One problem with this is that many academic societies are themselves run like for-profit businesses. They seek to generate as much revenue as possible, and diamond open access would threaten this model. They have embedded relationships with publishers and agree to renew contracts together, mostly independent of the scientists they serve. I witnessed this first hand with the American Sociological Association and Sage [38, 39]. Contracting a for-profit publisher provides a non-profit academic organization a scapegoat for amassing capital via subscription fees. We need to seriously ask ourselves: should our academic societies' goals be to collect the greatest amount of cash possible?

The embeddedness of big publishing in science, and the capital that associations can raise through their journals when run by big publishers, are major barriers to flipping. Another major barrier is that some big publishers coerce scientific societies into signing away the rights to the titles of their journals in their publishing contracts. This tactic is most intensively deployed by Elsevier. They own the rights to the titles of nearly all the journals they publish. Therefore, when these societies want to change publishers, they cannot. They are trapped. They would have to start a new journal with a different title – what happened for example with the Journal of Infometrics [40]. There is otherwise no way around this problem because of copyright law.

There are exceptions, and they offer model success stories. Computational Linguistics is one of the earliest journals considered to be among the top in its field to flip to diamond open access. The first step was a move by the Association for Computational Linguistics in 2002 to create the CL Anthology which made all articles published by association journals open access online after an embargo period. Then in 2009 the journal Computational Linguistics flipped to diamond open access. The journal Demography of the Population Association of America is another example.

Bearing these institutionalized barriers in mind, collective efforts to build the popularity of new diamond open access journals would greatly increase the movement toward a more ethical and effective scientific enterprise. If these are journals from societies, which are essentially the same journal but with a new (not copyrighted by Elsevier) name, it requires authors to support this journal and immediately abandon the other. Supporting new diamond open access journals, whether completely new or newly named, requires established scholars to put their status-seeking egos aside in the name of scientific progress and ethics. It is precisely those who have built major scientific reputations who need to engage in this change, because they can give new journals the most clout by touting them and publishing in them.

Scholars and societies alone cannot carry the burden. Hiring committees need to reward these behaviors. Rather than seeing a publication in a new 'unranked' or 'low ranked' diamond open access

journal as a sign that the article is 'not high quality enough for top journals', committees should judge publications only on their content. Then, if two publications are seen as equally scientifically rigorous and high quality, the one in a diamond open access journal should get a greater weight. Scientists who consistently publish high quality research in diamond open access journals should be favorites of hiring committees, all else equal.

A hiring committee would be unlikely to reward an applicant who shows sociopathic behaviors. Following this logic, they should not reward scientists who show behaviors that go against ethical science by practicing closed and profit-incentivized science. I need to be very clear here that I personally am still publishing regularly in journals published by for-profit publishers. I am not that famous, and I do not have tenure. This is a perfect example of why we need sweeping changes at the institutional level, and from the top of the scientific hierarchy.

Nonetheless, I am making an effort to signal that I think that this journal, Bulletin of Computer and Data Science (BCDS), is an ideal example of a journal that we could support and could then have an impact on producing a more ethical science. It will certainly take time. And history suggests the odds are not in its favor. I have selected this journal because they contacted me, and they presented themselves in a way that I support. Humble, diamond open access and seeking to build better science. I checked their model and they have a dedicated editorial board and a for-profit firm that is doing pro bono work to support a completely free publishing model, because there are government incentives for this and I assume because they can develop their own product through this experience. We as scientists rely on many for-profit services (for storage, security, word processing, building our equipment, etc.). The goal is not to eliminate them, but to remove their impact on our work as much as possible.

With efforts to flip both existing journals and efforts to reward new, ethical journals, we give science its greatest future chances for improvement and sustainability. There are many efforts underway and these should serve as guides, for example the Diamond Open Access Fund from the Dutch Research Council and MIT's shift+OPEN initiative.

Diamond AI

Diamond open access has a second, equally important role for the future of science. It is necessary to inform Generative Artificial Intelligence (Gen AI). The LLMs that power popular Gen AI are trained heavily on corpora assembled from what is available via the Internet. Paywalled literature is missing from training corpora, not because it is unimportant, but because it is not accessible or legally usable [41]. Gen AI outputs are therefore based on a highly restricted sample of all scientific knowledge. Open access for all of science would ensure that anyone using Gen AI, would get the best possible information based on all that we know as humans. As essentially everyone is using Gen AI today [42], this would mean that the public would be optimally informed.

It is not necessary for Gen AI development that all articles are diamond open access, they just need to be somewhere, e.g., green or gold open access. Yet, without diamond open access the entire knowledge enterprise will continue to favor the work of those with greater resources – those who can afford APCs [43]. Resources are of course necessary to produce higher quality science because of research costs, but when it comes to publishing and dissemination, a resource advantage reproduces the already existing Global North-South disadvantages in science. This limits human capacity to tap resources in lower income societies. These are societies filled with potential contributions to science

that could benefit both 1) their own societies' development – because it enables them to gain status, resources and build stronger, more attractive and sustainable scientific institutions, and 2) all of scientific knowledge because there are brilliant minds waiting to be tapped that might otherwise give up on science because it is for them no sustainable in their region.

If the knowledge in Gen AI remains Global North and WEIRD biased (Western, educated, industrialized, rich and democratic), the result is that these countries remain culturally and economically advantaged beyond that which exists presently. This means that without diamond open access norms, we are willingly allowing Gen AI to increase cultural hegemony and economic domination of a minority of countries and persons. I am not directly arguing whether this is good or bad. I am in the Global North and profit from a stronger Global North science advantage. My argument is that science should be neutral, favoring the most optimal and reliable knowledge, rather than legacies or strategies that game the scientific system.

Ethical Statement

I have no conflict of interest to report. I used Google search which includes Gemini by default, ChatGPT and NotebookLM to support my literature review, check arguments, suggest words or phrases and to extract facts. No writing was copied in from Gen AI, it is all my own. Any mistakes or opinions are also my own.

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