

Open access, data capitalism and academic publishing

Hagner Michael

Science Studies, ETH Zürich, Zürich, Switzerland

Summary

Open Access (OA) is widely considered a breakthrough in the history of academic publishing, rendering the knowledge produced by the worldwide scientific community accessible to all. In numerous countries, national governments, funding institutions and research organisations have undertaken enormous efforts to establish OA as the new publishing standard. The benefits and new perspectives, however, cause various challenges. This essay addresses several issues, including that OA is deeply embedded in the logic and practices of data capitalism. Given that OA has proven an attractive business model for commercial publishers, the key predictions of OA-advocates, namely that OA would liberate both scientists and tax payers from the chains of global publishing companies, have not become true. In its conclusion, the paper discusses the opportunities and pitfalls of non-commercial publishing.

Key words: *Open Access, data capitalism, academic publishing*

Introduction

In December 2017, many researchers in Switzerland would have received two emails that appear at first glance to be almost unrelated. The first email, from Matthias Egger, President of the Swiss National Science Foundation (SNF), informed them that from 2020, all publications based on research subsidised by the SNF – whether journal articles, book chapters or monographs – must be made available free of charge and in digital format. What Egger euphemistically describes as a joint push to attain a worthwhile objective is in fact a coercive measure that robs researchers of the freedom to publish their research where they see fit. With this step, considered more damaging for book publishing than for publishing articles in periodicals, the bureaucratic dream of controlling the venues and media of academic publishing has almost become real [1, 2]. Whether this massive intervening into academic freedom impacts scientific content and quality, only time will tell. The second email was sent by the global publisher Elsevier, one of the agents that, through its unscrupulous pricing policy, has had a ruinous effect on traditional academic publishing. In the email, Elsevier invites researchers

to submit their articles to the new mega-journal Heliyon, which publishes research findings from across all disciplines. The quality of this Open Access (OA) journal is said to be guaranteed by a “dedicated expert editorial team” and an editorial board of over 900 researchers. Similar to other mega-journals, a short timeframe of 4 months between submission and publication is promised; the article processing charge (APC) for authors is set at \$1,250 per article [3].

Scientific organisations and funding bodies such as the SNF, the Max Planck Society (MPG) or the German Research Foundation (DFG) have been arguing for years that scientific publishing must be freed from the pricing dictatorship of academic publishers. Open access was meant to show the way. Now it looks as though the top science bodies that distribute or receive public funds are acting in concert with the publishing giants that appropriate those funds to their own commercial advantage: the former are making Open Access compulsory for scholarly publications, and the latter stand ready to publish the research findings on OA – for a hefty fee. How could such a bizarre situation have come about?

Since the beginning of the twenty-first century, politicians, managers, librarians and some researchers have told a standard narrative about OA. Frequently found on the relevant websites, the narrative goes something like this: OA will usher in a new era in the history of academic publishing by making available all the knowledge produced by the worldwide scientific community, free of charge, to anyone with an internet connection. There should be no more barriers to science in the global exchange of information and ideas, no more obstacles for ordinary citizens wishing to keep abreast of the latest scientific developments. Such prospects sound attractive since, by associating the free circulation of knowledge with the economically motivated hope for increased creativity and efficiency, they allow the sciences to play their part in the global competition for resources and innovation. At the same time, they express a philanthropically motivated aspiration that science’s regrettable – and, from the sciences’ point of view, far from harmless – alienation from the rest of society might be reversed [4].

Experiences of recent years have shown, however, that OA is far more complex than the optimistic standard narrative would lead us to believe. The practice of OA is dom-

Correspondence:
Prof. Dr. Michael Hagner,
ETH Zürich,
Science Studies,
Clausiusstrasse 22, RZ,
CH-8092 Zürich,
mhagner[at]ethz.ch

inated by a number of different stakeholders with partially conflicting interests. These include politicians, global publishing consortia, funding agencies, science managers, librarians, digital activists, the computer industry, and researchers themselves, with all these being far from forming a homogeneous bloc, and including, in the case of medicine, patients, physicians and patient advocacy groups. From this constellation has emerged a conglomerate made up of monetary flows, moral and epistemic economies, legitimate and less legitimate interests of various stakeholders, post-Gutenbergian technophilia and New Public Management, based on which OA becomes a difficult phenomenon to grasp. Put in the most basic terms: as a business model of academic capitalism, OA is already a reality; as a programme for bringing together the human race in intellectual dialogue and a common quest for knowledge, it remains a utopia.

This thesis presupposes, on the one hand, that OA is a humanistic project in the Enlightenment mould, and on the other, that the circulation of knowledge, no less than the circulation of commodities and money, is subject to an economic logic. In accordance with the neoliberal doctrine that every political or legal intervention represents an impediment to market activity, anything standing in the way of OA is seen as an undesirable disruption to global scientific exchange. The alleged paradox that the state and its representatives concerned with scientific management make OA compulsory simply shows that politicians believe in the economic benefits pertaining to online circulation of information and data. The Israeli historian and bestselling author Yuval Noah Hariri put it well when he remarked, apparently without critical intent: “Just as free-market capitalists believe in the invisible hand of the market, so Dataists believe in the invisible hand of the dataflow.” [5] Assuming for a moment that “dataists” are not just “free-market capitalists” with programming expertise, liberality and openness have two meanings in this context: as a *commons*, OA represents a universally available good; as a *commodity*, it forms a gigantic open data reservoir which those who enjoy access to the appropriate technologies can draw from at will in pursuit of their own material interests [6].

The end of traditional academic publishing

Although the brief history of OA does not allow any firm conclusions to be drawn about which way the scales are tilting, there are several early signs. The loudest calls for OA to be introduced across the board have come from STM, the fields of science, technology and medicine. This is understandable, given the way scientific journals evolved in the second half of the twentieth century. After the Second World War, the British media proprietor Robert Maxwell came to the realisation that far more money could be made from scientific literature than had previously been earned by science publishers, which were mostly modest family firms. After buying Pergamon Press, still a fairly new company at the time, he integrated researchers into the system in a manner very different from that to which they had been accustomed. Scientists were invited to cocktail parties, wined and dined at five-star hotels, given financial incentives to launch journals or allocated a share of the profits [7]. With that, Pergamon Press (which was

taken over in 1991 by Elsevier) developed a first model for academic publishing as big business. From the 1970s, this led to increased concentration in the previously diverse market of publishing companies specialising in the natural sciences. By 2000, the market had contracted to a handful of global publishing consortia, Elsevier, Springer and Wiley at the fore, which were able to increase their prices for scientific periodicals more or less at will [2]. At the same time, the natural sciences began defining their originality in quantitative terms, particularly through the so-called impact factor of journals, giving rise to the fatal nexus between economic capital, on the side of the publishing houses, and cultural capital, on the side of researchers. By now, it is common knowledge that a journal’s high impact factor correlates with a high reputation and, in a number of cases, a steep price as well – up to 20,000 euros for an annual subscription to a single journal.

University libraries, research organisations and funding bodies have had to fork out ever more money for these periodicals. Around the world, libraries spend 7.6 billion euros per annum on scientific journals, which means that, with around 1.5–2 million articles published each year, one article costs an average of 3,800–5,000 euros [8]. This is a rough estimate, because it is based on information given in the “Web of Science”, which is quite selective in incorporating periodicals in languages other than English [9]. In fact, a more realistic estimate might be based on the assumption of 2.5 million articles published each year. Be that as it may, there has been growing outrage that (mostly) public money earmarked for scientific research has been effectively lining the pockets of shareholders, investors and speculators, given that publishing monopolists tend to reinvest only a small percentage of their profits. The profit margin of publishers like Elsevier or Springer exceeds 30%. It can hardly be denied that the publishing companies in question ultimately destroyed the traditional system of academic publishing through their extortionate pricing policies. Yet for all the irreparable damage done by publishers, it should not be forgotten that in recent decades the criteria for evaluating scientific quality have changed fundamentally. The “publish or perish” culture, impact factors and h-indices were not invented by science publishers; they were generated from within the sciences themselves. This unfortunate over-emphasis of quantitative indicators for characterising scientific quality and defining the scientists’ reputation has rendered STM-disciplines vulnerable to commercial interests. To put it bluntly, science publishers have been immensely successful in transforming the sciences’ “cultural capital” (P. Bourdieu) into economic capital [10].

Science policy and economic policy

Since the nineteenth century, the modern industrialised nations have speculated – with greater or lesser degrees of success – that the knowledge produced by scientific research can provide a stable basis for economic prosperity. The chemical and pharmaceutical industries are successful and well-known examples of such knowledge transfer. In the 1970’s, the postulated link between science and the economy was given a new twist with the idea of a “knowledge society”, a concept developed in the US by sociologists and economists around 1970, characterising the trans-

formation from industrial to postindustrial society [11, 12]. In such a society, knowledge is declared to be the key reference point for economic growth. Put schematically, the process by which knowledge came to be treated as a quasi-economic resource may be reconstructed in four steps. First, investment in education and science was boosted to the benefit of all sectors. In a second step, those sectors that promised the strongest economic effects were singled out for targeted support. The massive investment in biomedicine since the 1980s, for example, was not motivated just by the wish for improved public health, but was intended in at least equal measure to create new markets that would increase the developed nations' economic clout. Thirdly, the always problematic distinction between pure and applied research was deconstructed in such a way that pure or theoretical research now appeared as an ideologically charged chimera that ultimately had no right to exist. Science Studies and History of Science – disciplines that set out to offer a more realistic view of scientific practice – bore no small responsibility for this demolition job. What they could hardly have foreseen was that, fourthly, the collapse of the old distinction would prepare the ground for a new one: that between “innovation-relevant research results” [13] and research deemed irrelevant to innovation. This is the stage we find ourselves at now. In essence, the instrumentalisation of knowledge as a resource has become a mandated imperative: sciences are declared legitimate or less legitimate depending on their commercial and societal-use value. This process seems to have been taken the furthest in the United Kingdom, with consequences for universities that have already become apparent [14]. In the face of Brexit, this situation will probably be exacerbated still further.

Against this historical background, the digital revolution has become the catalyst for a commercialisation of knowledge. The word has spread that data is the currency of the twenty-first century. Scientific research results can thus become valuable data if they are appropriately packaged and circulate freely enough to attract interest from the big players of data capitalism. Scientific knowledge has taken on a commodity character that it lacked before, when it was produced within a scientific institution and access was limited to a scientific peer group. That such an understanding of knowledge reflects the will of politics as well as business interests is clearly expressed in an amendment to copyright law passed by the German Bundestag in 2013: “It is a fundamental condition for innovative research and the transfer of scientific results into goods and services that information be allowed to flow as freely as possible. [...] Knowledge is a crucial factor in global competition. Without a productive science system and effective knowledge transfer, a culture of innovation is unthinkable.” [15] Whereas such statements would have been anachronistic before the rise of the internet, they now authorise the removal of any obstacles that may interfere with the free flow of information and prevent commodified knowledge from spawning innovative economic effects. To be sure, there is a difference between free access to knowledge (OA) and free access to data (Open Data). However, as politicians tend to mention these two issues in the same context, this proves quite revealing, given that they see both in the light of the economic benefits brought by circulation. From this perspective, the imperative to innovate

translates into the requirement that the research process terminates in a commercially viable product. When OA is so blatantly championed for its role in stimulating innovation in a knowledge society, and hence for justifying its place in the order of academic capitalism, doubts are justified as to whether it has come any closer to fulfilling its promise to make scientific knowledge primarily a commons rather than a commodity.

The close links between OA, the invisible hand of circulating data and the sciences' subordination to political imperatives are nowhere made clearer than in the European Union's current research policy. Horizon 2020, the EU Framework Programme for Research and Innovation, is nothing but an undeclared economic development programme to the tune of some eighty billion euros. In the information brochure put out by the German Federal Ministry for Education and Research, it is stated that science is expected to provide “solutions to the challenges currently facing Germany, Europe and the world”. Similar mission statements can be read in Switzerland, Britain and many other countries. This is in principle a legitimate demand, albeit one that is not easy to realise. Above all, it needs to be asked what part the potentially problem-solving sciences should play in the ensemble of all the sciences, since even in the STM disciplines there are many researchers with an interest in less topical fields than climate change, Alzheimer's disease, personalised medicine, nanotechnology or quantum computers. What is to become of them? Disturbingly, the proposed ministerial solution is “facilitating scientific research and further improving collaboration between science and the economy” [16]. This emphasis on commercial utility naturally disadvantages any research in the natural sciences that is geared to the pursuit of knowledge for its own sake, rather than to application, exploitation and profit. We will only know how such “pure” research has fared under the new dispensation once we have a comprehensive overview of the programme, which has been in place only since 2014. Yet it does not bode well that even the Alliance of German Research Organisations, a federation of top science bodies dominated by the natural sciences, has expressed its concerns about the economic logic behind Horizon 2020 [17].

Enlightenment from Brussels

It might be asked what the EU's research policy, this most trenchant expression of academic capitalism, has to do with OA, other than the general fact that it operates in an environment where OA has been declared the new norm for academic publishing. The link becomes clearer if we consider the example of EU Research Commissioner Carlos Moedas, a qualified civil engineer who pursued a career in investment banking with Goldman Sachs and Deutsche Bank, among others, before making the switch to politics. In July 2016, Moedas gave a talk at the EuroScience Open Forum (ESOF) in which he looked back to the Enlightenment in praising Europe's epochal importance as a growing “open global research area”. This is not wrong in principle; in 1793, the Marquis de Condorcet wrote in hindsight that the introduction of the printing press had made it possible “to circulate any book required by the circumstances of the moment or the transitory changes of opinion, and, in consequence, all men who speak the same language can

become alive to any question discussed anywhere.” [18] This idea was also key to those behind the so-called 2001 Budapest Initiative, which marked the most important step in the world-wide acknowledgment of OA. Brimming with philanthropic enthusiasm, they envisaged “uniting humanity in a common intellectual conversation and quest for knowledge.” [19]

While Carlos Moedas’ idiosyncratic version of the history of science since the eighteenth-century republic of letters warrants close reading, two aspects must suffice here. On the one hand, Moedas is consistent in speaking only of the natural sciences. This is no personal foible: it mirrors the ideological trajectory of academic capitalism. Since around 1970, theorists of the knowledge society such as Peter Drucker have predicted fairly accurately that manual labour would become ever more irrelevant in the knowledge society, but they drew from this the false conclusion that such a society would be post-capitalist in orientation [20]. Nothing could be further from the truth, as is shown above all by the fact that, in the digital knowledge society, intellectual work that cannot be put to any direct economic use, as represented paradigmatically by the liberal arts, has become increasingly unimportant. There is no need to demonstrate in any detail that such a development plays into the hands of populist movements on the right, which have targeted the liberal arts as an enemy in their anti-intellectual crusade.

On the other hand, Moedas sees Open Science in the twenty-first century as essential for “restor[ing] trust and confidence in science”. Is the public standing of the sciences as dire as that of the European Union and politics in general? I would hope not, yet Moedas conjures this spectre only to banish it immediately with a therapeutic proposal that triangulates the public sphere, scientists and data. He suggests that making publications and data completely accessible to a digital public is the precondition for the continued flourishing of the sciences. Dataism is no less at home in the offices of the EU than in Silicon Valley, and since nothing can be a mere end in itself, fetishised transparency is elevated to the status of a panacea on which nothing less than the preservation of democracy is seen to depend: “By continuing to allow the gap between public perception and scientific ambition to increase, we risk, at best, apathy and, at worst, complete distrust at a crucial juncture.” [21] If the words “scientific ambition” are replaced with “political action” in this sentence, we would have here a common interpretation of recent political developments in the USA, Europe and Britain: at first, citizens reacted with apathy, boycotting elections, then with complete distrust, facilitating the rise of populist parties on the right. It is not my task to analyse the simplicity or plausibility of this interpretive template. But by applying this template to the relationship between science and the public sphere, Moedas invokes populism as a background threat: citizens are already talking about the fake news media and lying politicians; if scientists are not careful, they may soon start decrying fake science as well – as rightist populists are already in the habit of doing in the case of climate research, vaccination and Gender Studies [22]. The crisis of scientific expertise, and potential developments within the sciences themselves that may have contributed to this crisis, would merit their own separate essay. Suffice to say that in light of recent developments in the USA, where concepts like “scientifically

proven” have been struck from governmental parlance, the scenario conjured up by Moedas seems highly frivolous, to say the least.

With his dramatic intervention, Moedas makes clear that he sees Open Access and Open Science as nothing less than the keystone for a new “republic of letters”. Summarily declaring institutions to be in urgent need of reform has always provided a useful pretext for transforming them beyond recognition. Setting aside such trivialities as Moedas’s own credibility and his road-to-Brussels conversion from bank-friendly Saul to citizens’ advocate Paul, as well as his expulsion of the liberal arts from the new republic of letters – how exactly does the EU Commissioner envisage the reality of OA? Instant access to scientific publications for all, text and data mining are to become standard – but will this really allow citizens to scrutinise the work of scientists more effectively? Can Open Access and Open Data build greater trust in science, providing the public with certainty that research findings have not been “falsified, fabricated or plagiarised”? How can laypeople possibly judge such matters for themselves when they lack the necessary qualifications for evaluating scientific research, be it in astrophysics or Assyriology? Such much-needed quality control will continue to be undertaken, by and large, by the experts themselves, as it has been made very clear in a recent statement by three national academies (Académie des Sciences, Leopoldina and the Royal Society) on good practice in evaluation [23]. To that extent, it may be supposed that the standard of Open Science envisaged by Moedas involves reading machines which process data from the viewpoint of commercial viability or applicability.

The reality of Open Access

In view of the link between OA and data capitalism, a reality check may be in order. OA has shown mixed results. First of all, OA has led to the creation of countless new digital journals with dubious editorial standards. Most are small money-making machines that charge authors fees to publish articles that would never be accepted by more serious journals. By flooding the market in this way, OA has exacerbated the already virulent problem of over-publication and generated even greater opacity through the supposed transparency of its procedures. A constantly updated list of “predatory publishers” is helpful, but it is not exactly a ringing endorsement of the academic publishing industry [24]. A second declaration jointly issued by the Académie des Sciences, the Leopoldina and the Royal Society, rightly ascertains: “These journals lack the essential mechanism of self-correction and critical review that science requires. The number of these pseudo-journals is doubling each year. The public will be, or is already, confused by this flood of ‘scientific articles’ and will not understand what is a valuable publication.” [25] This verdict stands at odds with that pronounced by EU Commissioner Moedas: far from promoting greater transparency, OA has led to greater uncertainty with regard to the quality of scientific publications, since quality control, even in the STM disciplines, is far more fragile than had previously been thought. The idea of OA is not to blame for this development, but rather the fact that OA has so quickly and unforeseeably turned into a lucrative business model.

Another consequence of OA has been the introduction of a new academic publishing format: the mega-journal. This is a digital platform, not a traditional journal, which accepts articles from across many or even all scientific disciplines and publishes hundreds if not thousands of papers each year. In most cases, such numbers are only possible if the sole criterion for publication is methodological correctness rather than originality, brilliance or relevance. Hence, this new publishing form was meant to be a reaction to a spreading uneasiness within the scientific community regarding the long publication time, along with the supremacy of non-quantitative parameters like relevance. The first mega-journal was PLOS ONE, a noncommercial project of the US Public Library of Science. Founded in 2007, PLOS ONE published over 30,000 articles a year in its prime (2013 and 2014), and there were some observers who believed that the future of academic publishing lay in such mega-journals: fifty journals as big as PLOS ONE could keep up with global demand by publishing around 1.5 million papers. Such a development has yet to occur. In 2017 only 20,000 articles appeared in PLOS ONE, and its impact factor has declined from 4.411 to 2.806 [26]. It is too early to give a credible explanation for this fall, but this much is clear: although mega-journals occupy a significant niche in the academic publishing market, they are not the gold standard. Moreover, the enormous economic success of PLOS ONE – with a fee of \$1,500 per article, the journal reaped a revenue of \$30 million in 2017 – motivated commercial rivals to start their own mega-journals. Elsevier's Heliyon is only the most recent example; Scientific Reports, founded by Springer in 2011, has surpassed PLOS ONE with 25,000 papers published in 2017 alone. Mega-journals evidently compete with each other for authors, whereby variables such as impact factor, fees, turnaround time and other services may prove decisive for their future fate. At any rate, mega-journals are a bold experiment with a still uncertain outcome, since no one can confidently predict the medium- to long-term effects on the quality of scientific publications of a review system that pays heed only to methodological correctness.

A further, practically unavoidable, problem may be the mix of economic and epistemic considerations faced by commercial publishers. If a publisher's earnings rise in proportion to the sheer number of papers published in a mega-journal, there is an obvious risk that the criteria for rejecting an article will become ever less stringent. Institutions such as the Académie des sciences, the Leopoldina and the Royal Society are acutely aware that the conflation of commercial and epistemic interests in digital publishing today poses the most pressing threat to research standards since the Second World War. That OA – quite against its original intentions – has played a role in this development is a fact that has not been taken seriously enough to date. The EU Commissioner is most likely correct in pointing out that Europe is the first region in the world where OA has become the “norm” for academic publishing; but he could not be more wrong in seeing this as the centerpiece of a new “republic of letters” that exists only in his own Panglossian imagination. Whether and how the sciences and the humanities preserve their credibility, their originality and their relevance will depend on a variety of factors, but surely not in the first instance on the discernment of the so-called public, which has hardly inspired a great deal of

confidence of late. To be sure, there are fundamental differences among the various scientific disciplines. While it proves perfectly legitimate that patients and patient advocacy groups have access to scientific knowledge, it must be stressed that free access is only one feature of a broader communication network of citizen science. Propagating public discernment across other disciplines ranging from particle physics to Byzantine Studies is all too often guided by dangerous populist calculations.

On the other hand, much will depend on the extent to which the STM disciplines succeed in regaining control over academic publishing and breaking the monopoly of commercial publishers, if not bypassing them altogether. In this respect, it is worth casting a glance backwards at the scholarly republic of the seventeenth century, when learned societies such as the Royal Society or the Académie des sciences brought out journals under their own editorial direction. From this point of view, the following sentence from the previously cited paper released by the three science academies is striking: “We would like to see science publishing move away from large corporate interests and a stronger involvement of academies and learned societies in order that any surplus funds may be used for the benefit of science.” [27] Whereas further thought and work must be concentrated on this issue, there is no point in harbouring unrealistic expectations, given that some scholarly societies run journals with pricing practices that do not differ from those of their commercial counterparts. Obviously, the economic mentality has gained ground in the non-profit world of science, and that might be one reason why academic publishing will continue to operate under the market conditions of data capitalism for the foreseeable future.

The Open Access strategy of the information companies

Within a relatively short period of time, the global publishing monopolists have learned to adapt their business model to OA. Erik Engstrom, CEO of Reed Elsevier, summarised the transformation process several years ago: “In 2013 we continued to make good progress on our strategy to systematically transform our business into a professional information solutions provider that combines content and data with analytics and technology to deliver improved outcomes for customers.” [28] In other words: digital platforms are made available and customers are offered help in uploading, searching, scanning, delivering and processing data and content. In addition, these platforms are communications networks for regulating global data flows among scientists. The RELX Group, including Elsevier with its roughly 3,500 journals and over 48,000 books, has enjoyed great success in this line of business. In 2016 RELX had a turnover of 6.89 billion British pounds, of which Elsevier contributed some 2.32 billion [29]. From a shareholder's perspective, this is undoubtedly a success story. Evidently, neither boycott initiatives nor international criticism of the publisher's pricing policy nor its transition to OA have done any damage to the company [30].

One reason for Elsevier's lasting success is that the company recognised early on the enormous commercial potential of a combination of Facebook for scientists and “professional information solutions provider”. Most scientists

are members of one or more of the following networks: Mendeley (five million members), the Social Science Research Network (over two million members), Researchgate (ten million members) and lastly the mega-platform Academia.edu (fifty-eight million members). These four platforms, repositories and social networks began life as philanthropic start-ups, yet the first two have for some years now been owned by Elsevier. It is probably only a matter of time before the remaining two are entirely caught in the web of data capitalism. Good money is already being made with these networks, and it will only increase over time. The more members they have, the greater the volume of articles and other meta-data which the networks will be able to mine and exploit at will. No one will be able to prevent cost pressures from building up once again, only this time it will not be libraries footing the bill but the scientists themselves. A start has already been made. Through the friendly collaboration of its 58 million members, Academia.edu now has access to so many digitally formatted articles that it has begun offering premium memberships for \$100 a year. In return, premium members can “search the full text and citations of our millions of papers” and receive constant updates on when and where they are cited by whom [31]. Human vanity has always been a money-spinner, yet when it is additionally encouraged and rewarded by the political settings, digital academic capitalism can thrive without impediment. To be sure, all publications uploaded to Academia.edu and other such networks are OA for members, but there is still a price to be paid in the form of the data uploaded to the network. Moreover, it is far from unlikely that the annual fee for premium membership will sooner or later be levied on everyone. Anyone who entrusts his or her data archive, publications repository and scholarly contacts to a commercial cloud that uses the available data as a research resource, relying on it for global visibility and contacts with fellow researchers, is no less vulnerable to extortion than a research library forced to pay absurd prices for journals. No wonder the old formula, “publish or perish”, has since been updated to “promote or perish” [32].

Who controls the academic publishing system?

In light of the above, I would argue that the badly damaged system of academic publishing will not be restored to full health by OA *per se*, but at most by the sciences themselves taking greater control over their publications. Two pathways are currently emerging for how this might be achieved, at least to some extent. One involves the previously mentioned possibility of scientists regaining partial control over the publishing industry and so providing the global concerns with noncommercial competition. The other is for national or international consortia to make contracts with the most important concerns to guarantee price stability, at least for a certain period. Both options are realistic, but each has its pitfalls.

In early 2015, employees at the Max Planck Digital Library published a kind of manifesto declaring that the time was now ripe for a radical changeover from subscriptions to OA [33]. This was in line with both EU and SNF stipulations. A few weeks after the article appeared, the Max Planck Society (MPG) announced that three in-house OA journals based at Max Planck institutes had been trans-

ferred to Springer Science and Business Media [34]. These journals – *Living Reviews in Relativity*, *in Solar Physics*, and *in Computational Astrophysics* – had quickly established a high reputation and seemed to provide a successful model for nonprofit journals. No reasons for the handover were given at the time, but according to statements from one of the researchers involved, the organisational and administrative costs of running these journals was so great that the decision was made to transfer them to a commercial publisher [35]. This argument is perfectly reasonable, and it points to the difficulties for research institutions to establish and maintain excellent nonprofit journals.

Similarly to *Swiss Medical Weekly*, these three journals are all Platinum OA, meaning that authors are not required to pay APCs. While this is good news for authors, it also raises the question as to which kind of business model these journals are operating on. After all, it would be naïve to think that Springer acquired them on philanthropic grounds, as a loss-making investment rather than a source of revenue. In the past, we read on the *Living Reviews in Relativity* website: “Founded and supported by the Max Planck Society.” This sentence has recently been deleted and replaced by the following: „Published under the auspices of the Max Planck Society“ [36]. As the case may be, according to Springer Nature, the costs for *Living Reviews* are covered in-house, because these journals are part of a wider physics and astronomy business [37]. It must still be seen whether either the *Living Reviews* will remain Platinum OAs in the future or Springer will impose APCs at some point in time.

In another case, the MPG has found a way to run a non-commercial journal: the Cambridge-based journal *eLife*, co-founded in 2011 with the Howard Hughes Medical Institute and the Wellcome Trust. Despite enjoying financial and strategic backing from these institutions, *eLife* shows in exemplary fashion that quality, professionalism and success are not to be had for nothing. APCs of \$2,500 for each article accepted for publication were introduced on 1 January 2017. The rationale for the new policy was plausibly set out on the journal’s website [38]. For one thing, the number of published articles could be significantly increased: from 27 in 2012 to more than 1,082 in 2016. The journal was also facing costs of 3.4 million GBP for editors, reviewers, staff, online systems, marketing and other services. In addition, it was investing over 1.4 million GBP in technology and innovation [39].

The example of *eLife* shows that, even for a nonprofit journal, scientific seriousness, market-oriented professionalism, adaptation to the latest developments in information technology and customer-friendly service that can compete with commercial providers come at a significant cost. From a scientific point of view, *eLife* has undoubtedly been a successful role model, particularly as it has bucked the trend set by the mega-journals. The percentage of papers accepted for publication lies at around 15%, with originality and brilliance playing a decisive role. At the same time, the journal’s editors and financial backers pay no attention to its impact factor. Its reputation is determined by the intrinsic worth of the articles published in *eLife*, not defined by questionable quantitative parameters [40]. From this perspective, there are grounds for hope that there are indeed serious alternatives to commercial providers, although the high cost barriers cast doubt on whether this is a

business model that lends itself to imitation. Even with fees for authors, considerable public subsidies are still needed to keep the journal afloat. In 2016 the cost per article was over 5,400 Euros (1082 papers with expenditure of 4.8 million GBP), conspicuously higher than the average price in the traditional subscription model. There are cheaper options, of course, but the principle stands that editorial independence, market competitiveness and fair pay for personnel come at a price for nonprofit projects. It remains to be seen whether states, international partnerships, scientific organisations, funding bodies and scientists themselves are in a position to compete with commercial publishers. Clearly, they will only succeed in doing so through collaboration, attractive offerings and a willingness to experiment, not through the kind of coercive measures taken by the SNF and other funding bodies.

There are other aspects that indicate just how hard it will be to return academic publishing to the stewardship of the sciences. A 2016 study on science publishing in Switzerland showed that the number of articles in scientific journals catalogued by Scopus had more than doubled between 2001 and 2015 from 14,000 to 31,000 [41]. These statistics are roughly in keeping with the classic 1963 study by Derek de Solla Price, who found that the number of journals had doubled approximately every fifteen years between 1660 and 1960 [42]. Even more interestingly in our context, in 2001 around 50% of all articles appeared in journals owned by the big four monopolists Elsevier, Springer, Wiley and Taylor & Francis. By 2015 this had fallen to 35%, but the absolute number of articles published by these companies has still almost doubled. In the same year, some 16% of all articles were published with gold open access. Unfortunately, the study does not indicate the proportion of articles appearing in OA journals belonging to the big four. Although I do not have access to comparable figures for EU countries and the USA, I would assume that in educational institutions where the STM disciplines are strongly represented, publishing conditions are similar to those in Switzerland.

Under such conditions, it would be unrealistic to expect that scientists will defect en masse to noncommercial publishing avenues. It is much more likely that they will continue to work with these publishers, particularly in countries or scientific institutions that can afford to pay APCs. A number of financially privileged stakeholders have already adapted to this situation. Since 2016, ETH Zurich has had its own budget for financing articles by ETH researchers published in one of Wiley's OA journals [43]. The Max Planck Society, for its part, pays its scientists up to 3,000 Euros per article (under certain conditions) so that their research can appear on OA. Disregarding the fact that only a few institutions can afford to pay APCs for their researchers, agreements with individual publishers are clearly problematic for the transition to noncommercial publishing platforms. Why would scientists scrape together 2,500 Euros to publish in *eLife*, for example, when the same article could appear in a Wiley journal without them having to devote a thought to finance?

This question may soon be posed in a very different way in Germany if the talks currently underway between the Alliance of German Research Organisations and the publishers Elsevier, Springer and Wiley arrive at a successful conclusion. Held under the keyword DEAL, the talks en-

visage national licensing contracts for all the digital journals owned by these publishers. At the same time, they would allow OA publishing to take place within this licensing framework. In effect, this would mean that all scientists working at public German research institutes and all students would have free access to the entire portfolio of the big players, and they could also publish in their OA journals at no extra cost [44]. At present, negotiations with Springer and Wiley appear to be going well, those with Elsevier rather less so [44]. If a deal is eventually reached, it would open a new chapter in the history of academic publishing, in spite of Dutch university libraries having already negotiated a less extensive Open Access deal with commercial publishers [46]. Never before has an entire state entered into a contractual agreement with publishers about the modes for publishing and accessing scientific research findings. That matters have come so far is due in no small measure to the unscrupulous conduct of those same publishers, which bled dry their previous negotiating partners, libraries, by skillfully playing them off against each other. To that extent, the German initiative is only logical. It would indisputably secure access to the relevant literature across the nation.

This comes at a not inconsiderable price, however. Firstly, the monopoly position of these publishers towards their lesser competitors will be reinforced. Bad experiences with monopoly-like power in the realm of academic publishing, as well as with the internet giants Google, Facebook, Amazon, Microsoft and Apple, appear to have given science organisations and politicians no pause for thought. Secondly, the gap between rich and poor in the academic world will widen still further. Researchers in structurally weak countries will gain nothing even as their German colleagues draw on practically unlimited resources. Thirdly, DEAL reveals a blatant contradiction between the option of strengthening noncommercial publishing and the consolidation of contracts with global concerns. As already indicated, why should an individual scientist in Germany decide to publish an article in a nonprofit OA, having to pay an APC for the privilege, if the same article can appear free of charge in OA format in a journal belonging to one of the publishers covered in the licensing agreement? Why should scientists invest their time and energy in a nonprofit project if the state has regulated everything for them in advance? And here a fourth problem becomes apparent: the fact that the state (or the EU) is meddling too much in the modes of academic publishing through its funding institutions. One does not need to be a hardened cynic to feel reminded of practices in the former East Germany or the Soviet Union; one just needs to be old enough. The major difference, of course, is that in this case data-capitalist concerns will profit from state intervention. Whether the Alliance of German Research Organisations intended it or not, it is demonstrating the Matthew Effect, a not uncommon phenomenon in the history of science: "to everyone who has, more will be given." [47]

There is thus a significant discrepancy between the reality of academic publishing and the optimism of politicians and science functionaries who praise OA as a panacea for all the ills afflicting science culture. In all likelihood, OA will continue to prevail under the conditions of academic and data capitalism, if for no other reason than that it has been – and for the foreseeable future will continue to be –

mandated by powerful politicians, scientific organisations and funding bodies. Individual scientists and institutions have made remarkable efforts to revitalise noncommercial forms of publication. In my view, this is the only way that the desperately needed reform of academic publishing in the STM disciplines can be achieved. Yet, it remains to be seen whether such tender shoots are able to survive and flourish in the wilderness of economically dictated interests, criteria and categories, which have unfortunately infiltrated the sciences themselves. It cannot be ruled out that nonprofit OA publishing will one day be cited as a textbook example of the “tragedy of the commons”.

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