

AGAINST PARASITE PUBLISHERS:
MAKING JOURNALS FREE

BRCP

Dedicated to Alexandra Elbakyan and Aaron Swartz.

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EXECUTIVE SUMMARY

The fruits of academic research mostly take the form of articles that are published in specialised journals. The majority of these journals are owned by a small number of commercial publishers, who benefit from public money to achieve record profits. This situation is detrimental to research and calls for a systemic change. The open-access movement has partially succeeded in promoting better practices, but it has not managed to fight the monopolistic control of these companies. Meanwhile, the digital revolution has permitted the development of fair alternatives that can be the seeds of a new global model.

This report is aimed at scholars, politicians, and institutions willing to take action to make the necessary shift happen. In the first chapter, the report reviews the history and current status of the academic publishing system. In the second chapter, it proposes a series of recommendations, based on concrete examples of solutions that have already been tested.

Our standpoint stems from a simple principle: knowledge should be free and accessible to all. To that end, action should take place at the different levels of the research pipeline:

- At the individual level, researchers can join boycotts of parasite publishers by refusing to submit, edit or review articles in their journals, and choose instead to publish in diamond open-access journals. At the very least, they should refuse to assign their copyrights to publishers and make a free version of their articles available on open repositories.
- Meanwhile, research institutes, universities, and libraries should consider terminating subscription contracts with the publishers, orient their researchers towards healthier publication practices, and support the creation of free journals.
- At the funding and policy-making level, it is necessary to reconsider the publishing platforms as part of the whole research infrastructure that deserves steady public funding, step back from using bibliometric indices to evaluate research and researchers, regulate the use of data by publishers, and support a revision of the international law on copyright.

This report is the result of one year of research and discussions by a working group of the *Basic Research Community for Physics* (BRCP). We hope that this report will contribute to the blossoming of a new academic spring.

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ACRONYMS

APC	Article Processing Charge
BOAI	Budapest Open Access Initiative
CC BY	Creative Commons - Attribution
DORA	Declaration on Research Assessment
DOI	Digital Object Identifier
DOAJ	Directory of Open Access Journals
JCR	Journal Citation Reports
OA	Open Access
PLOS	Public Library of Science
SPARC	Scholarly Publishing and Academic Resources Coalition
WIPO	World Intellectual Property Organization

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There is more than one way to burn a book.

— R. Bradbury [1].

A parasite is “an organism that lives [in] another organism of a different species, deriving benefit from [it], while not contributing [...] sufficiently to cover the cost to that other organism.” [2]. In this first chapter, we argue that the main commercial academic publishers behave as parasites to the detriment of the academic community. We start by reviewing the historical development of the current system (section 1.1). Then we make a critical assessment of the role that journals play today (section 1.2). Subsequently, we describe the economic power of the publishers who own the journals (section 1.3). Finally, we explain why this situation is detrimental to research (section 1.4).

1.1 A BRIEF HISTORY

The innovations of Gutenberg’s printing press in the 15th century enabled scholars to diffuse widely their research by writing books. Soon after the beginning of the scientific revolution in the 17th century, the publication of articles in periodical journals offered an efficient new tool for scholarly communication. Today, the publication of papers is the most direct and visible fruit of academic research. However, the social and economic structures managing the journals have evolved over time and the current system is only a recent post-WWII invention. Since the 2000’s, the publishing industry managed to adapt to the demands of the open-access movement. [3]

- 1534. Foundation of *Cambridge University Press*, the oldest university press and publishing house in the world [4].
- 1665. Creation of *Le Journal des Sçavans* in France, the first academic journal. Soon after, the *Philosophical Transactions of the Royal Society* appears in the UK. It still exists today [5]. The familiar functions of the scientific journal –registration, certification, dissemination, and archiving– are already present [6].
- 1710. Royal assent to the Statute of Anne. The British authors are granted the right to control the copying of their books. The duration of copyright is 14 years (renewable once), after which the books enter the public domain [7]. This new regime follows a period of censorship and monopoly (by the Stationer’s Company) and a period of no regulation, which called for a new licensing protecting the authors.
- 1852. Signature of a bilateral treaty between the UK and France: all articles published abroad in periodicals can be freely reprinted and translated, unless reserved rights are explicitly mentioned [8].
- 1869. Foundation of the British scientific journal *Nature* [9].
- 1880. Foundation of the Dutch publishing company *Elsevier* [10].
- 1886. Signature of the Berne Convention, an international agreement governing copyright. Its article 7 states: “Articles from newspapers or periodicals published

in any of the countries of the Union may be reproduced in original or in translation in other countries of the Union, unless the authors or publishers have expressly forbidden it.” [11] In today’s parlance, the Berne Convention grants a CC BY licence by default.

- 1908.** Berlin Act: revision of the Berne Convention. It reverses the standards: instead of being implicitly allowed, reproduction is now implicitly forbidden. Its article 9 states: “*Serial stories, tales, and all other works, whether literary, scientific, or artistic, whatever their object, published in the newspapers or periodicals of one of the countries of the Union, may not be reproduced in the other countries without the consent of the authors.*” The Berne convention has later been further updated, but this restriction remains. Most countries have now signed it [11].
- 1928.** Rome Act: revision of the Berne Convention. The article 6bis states: “*Independently of the author’s copyright, and even after transfer of the said copyright, the author shall have the right to claim authorship of the work, as well as the right to object to any distortion, mutilation or other modification of the said work which would be prejudicial to his honour or reputation.*”. This implements the moral rights of the authors, which is an essential feature of the *author’s rights* or *droit d’auteur*, as opposed to the *copyright*.
- Post-WWII.** The budget dedicated to science increases enormously. For instance, the average yearly growth of the US federal budget dedicated to non-defense R&D between 1953 and 1973 is more than 15% [12].
- 1951.** Robert Maxwell creates Pergamon Press. Academic journals used to be mainly owned by learned societies. Maxwell perceives the potential huge profitability of academic publishing as the public funding for research rises. He creates many new journals for specific fields of research and surfs on globalisation with grand titles like ‘International Journal of’. Pergamon Press is sold to Elsevier in 1991. [13]
- 1955.** The idea of an impact factor is first mentioned by Eugene Garfield in *Science*. It was originally thought of as a tool for librarians to identify journals to purchase, not as a measure of the quality of research [14]. Since 1975, it has been computed and published in the Journal Citation Reports (JCR), nowadays owned by Clarivate [15].
- 1970s.** Beginning of the serials pricing crisis: the prices of subscriptions to scholarly journals rise tremendously. For instance, between 1973 and 1987, the average price increases by 12% per year, while the costs for the publishers only rise increase by 8% [16, p. 22]. This difference between expenses and revenue enables the publishers to make big margins. Librarians start to organise and fight back.
- 1991.** Paul Ginsparg creates the free archive xxx.lanl.gov at Los Alamos National Laboratory, which will become [arXiv.org](https://arxiv.org) 10 years later [17].
- 2000.** Foundation of BioMed Central by Vitek Tracz. This publisher inaugurates a business model based on online open-access journals with an article processing charge (APC). It is now part of Springer Nature. [18]
- 2000.** An online petition receives the signatures of nearly 34,000 scientists who claim “*we will publish in, edit and review for, and personally subscribe to only those scholarly and scientific journals that have agreed to grant unrestricted free distribution rights to any and all original research reports.*” The initiative soon takes the form of a non-profit named the Public Library of Science (PLOS). It creates its first open-access journal, *PLOS Biology*, in 2003. Initially, depending on external grants, it develops a business model based on article processing charges. [19]

- 2002.** Budapest Open Access Initiative (**BOAI**). This landmark conference on the open access movement is organised by the Open Society Institute. It results in a public call to promote open access of scholarly literature, insisting on the need to remove all access fees for the readers, but it does not promote any particular model to cover the costs. [20]
- 2005.** The Wellcome Trust, a British research foundation, starts requiring open access for the research they fund. [21]
- 2006.** 50 million papers have been published since scholarly articles first appeared [5]. Over three centuries, the annual number of published articles has grown exponentially at a 3% rate.
- 2013.** San Francisco Declaration on Research Assessment (DORA). It declares “Do not use journal-based metrics, such as Journal Impact Factors, as a surrogate measure of the quality of individual research articles, to assess an individual scientist’s contributions, or in hiring, promotion, or funding decisions.” The declaration is signed by more than 2400 organisations, including universities, funding agencies, and also publishers like Springer-Nature or Elsevier. [22]
- 2021.** The Plan S requires scientific publications resulting from research funded by public grants to be published in compliant Open Access journals or platforms. It is supported by major institutions such as the World Health Organization, the Bill & Melinda Gates Foundation, the European Commission. [23]

1.2 THE ROLE OF JOURNALS

As was pointed out by Latour and Woolgar in their book *Laboratory Life* [24], scientific activity can be regarded, from an anthropological point of view, as mainly being concerned with the production of “papers”. The latter are then reviewed by peers before being published in specialised periodical journals. The eventual crystallisation of research results in the form of published articles can be traced back to the early times of modern science and is now generally shared by most research fields. Concerning the natural sciences, scholars still occasionally write books, but in most cases their content is a recollection of results that have already been published in journals.

In 1665 appeared the *Philosophical Transactions of the Royal Society*, one of the first academic journals. While preparing its first issue, the secretary of the Royal Society, Henry Oldenburg, identified four key functions of a journal: registration, certification, dissemination, and archiving [6]. It is worth noting that 350 years later, these functions are still expected from modern journals. In a recent talk, the editor-in-chief of *Nature Physics*, Andrea Taroni, mentioned the following three roles: separate signal from noise, curation, and creation of a narrative for a field [25]. Besides, from the point of view of funding institutions, journals are now used to quantitatively evaluate research (merits, significance, impact, etc.), which has been made possible with the development of bibliometric methods [26, p. 24]. Let us discuss these functions in more detail.

REGISTRATION, DISSEMINATION, AND ARCHIVING Before the Internet, journals, as material media, were an efficient way to publicise individual discoveries rapidly. As a consequence, they became authoritative references for identifying the author and the date of a discovery. As a result, publishers played a key role in printing the journals and sending them all over the world. Libraries received exemplars of each issue of the journals and stored them on well-ordered stacks for decades or centuries.

The advent of the Internet has completely changed the game. Registration, dissemination, and archiving are now much easier to perform, to the point that in

certain fields, such as physics, journals have been fully replaced by free alternatives to operate these tasks. For instance, preprint servers, like [arXiv.org](https://arxiv.org), are used to register new findings as early as possible, before even undergoing a formal certification procedure. Articles are freely stored on their servers and anyone can access the website to read them.

In parallel, journals still perform these tasks with their own websites and servers. Libraries that have subscribed to them can provide institutional credentials to the university members to access the articles. Journals also resort to third parties to assign a DOI (Digital Object Identifier) to the articles. This is a way to give persistent names to virtual objects, contrary to a standard URL, which may change, while the DOI remains the same. The assignment is provided by DOI Registration Agencies, such as Crossref, to which journals need to subscribe for a fee.

SELECTION, CERTIFICATION, AND NARRATION There are various possible criteria to assess whether an article should be published or not. Each journal proposes a different set of criteria. A minimal requirement is to check that a paper is not obviously wrong or fraudulent. However, most journals today also claim to assess the originality, the quality, or the potential impact of the article.

For a long time, the selection was made directly by the editors. After WWII, blind peer review became more prevalent [27]. The editors forward the submitted manuscript to a selection of experts in the field, who assess it and provide feedback in the form of a written report. Based on the latter, the editor decides whether the article is published or not.

Nowadays, the peer review process is often considered the hallmark of scientificity, but this opinion is certainly debatable. First of all, it is not clear what the goal of peer review should be. Should journals even try, in advance, to judge the originality, the quality, or the potential impact of a publication [28]? Some journals, like PLOS ONE, are promoting a peer-review process that focusses on rigorous research rather than potential impact [19]. Secondly, numerous studies have thrown serious doubts on the ability of peer review to even avoid obviously fake articles [29].

In addition to this process of estimating the scientific value of an article, journals contribute to shaping fields of research. By selecting a small subset of the existing literature, the most authoritative journals create a story of the development of a certain research topic or a whole field. This also shapes the directions of what is from time to time considered fashionable research, and thus incentivises certain research directions.

The selection of a limited amount of accepted articles could once be considered a necessity due to the unavoidable costs of printing. However, now that these costs have vanished with the advent of the digital era, the question must be raised again. Journals should certainly make more clearly the distinction between the necessary validation of knowledge and the contingent evaluation of its relevance.

EVALUATION OF SCIENTISTS To attribute grants, positions, or promotions, funding institutions evaluate researchers according to the volume of their publications and the prestige of the journals in which they publish. Indeed, for the same field of research, there are often different journals that range widely in prestige. The relative prestige of journals is mainly estimated by computing the impact factor. It is evaluated each year by Clarivate as the mean number of citations received during the current year by the articles published in the last two years. For instance, in physics, the impact factor spans from around 1 (Foundations of Physics) to around 50 (Nature). Such evaluation techniques have only been made possible by the development of computers and the ability to handle large amounts of data. It has now become widely accepted that the impact factor is a poor measure of quality of scientific research [30, 31, 22]. In spite of the signature of the DORA declaration by many of the most prominent research actors, the concrete practice of evaluating research does not seem to have improved much.

1.3 A PROFITABLE MARKET

The publication landscape has significantly evolved in recent years, in particular with the explosion of scientific output and the digital revolution. The market is dominated by very few publishers, which make considerable profit margins. The demands of the open access movement, which might have been threatening initially, have finally been accommodated by the industry with a new business model based on article processing charges (APC).

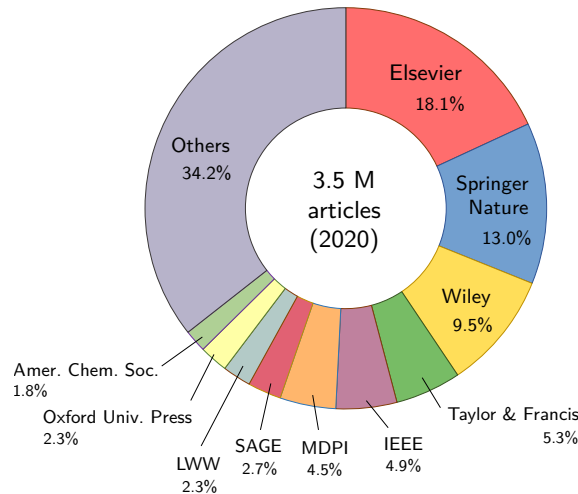


Figure 1: Share of published articles among top 10 publishers in 2020 [32].

According to Clarivate's *Web of Science*, one of the biggest databases for scientific publications and citations, more than 3.5 million articles were published by about 5,500 publishers in 2020 [32]. The top five publishing houses account for more than 50% of the publications - see Figure 1. In the past ten years, the number of articles increased each year by approximately 4% [33].

More than 70% of the publishers are declared not-for-profit, representing around 20% of the journals [34]. It is for instance the case of IEEE, Oxford University Press, the American Chemical Society. However, this designation is misleading because the practices of not-for-profit publishers can be even worse than that of for-profit publishers. This is because they tend to align their practices on the standards of commercial publishers. Besides, their specific tax regimes enable them to make sometimes even higher margins, while their accounting is often more opaque than publicly traded companies [35].

The global market of scholarly publishing has been estimated to be around \$28 billion in 2019 [33]. As a comparison, the global box office market (consumer spending at movie theaters) in the same year reached \$42 billion [36]. The revenues of the major publishers Elsevier, Wiley, Springer Nature, Taylor & Francis, IEEE and MDPI are shown in Figure 2 based on their annual reports [37, 38, 39, 40, 41, 42].

Compared to Apple, Google, and Amazon, whose revenue is about 100 times larger, the profit margins of publishers are higher (see Figure 3). This shows that scientific publishing is among the most profitable businesses in the world.

Since the beginning of the 2000s, the open-access movement has led the publishing industry to adapt its business model. Following the examples of BioMed Central or PLOS, most publishers now offer the possibility for authors to publish in open access, in exchange for a publication fee called the article processing charge (APC) paid by the authors or their institutions. In 2020, an estimated amount of 30% of all articles was published in OA [48]. The Directory of Open Access Journals (DOAJ) is maybe one of the most exhaustive lists with close to 17,500 OA journals. The

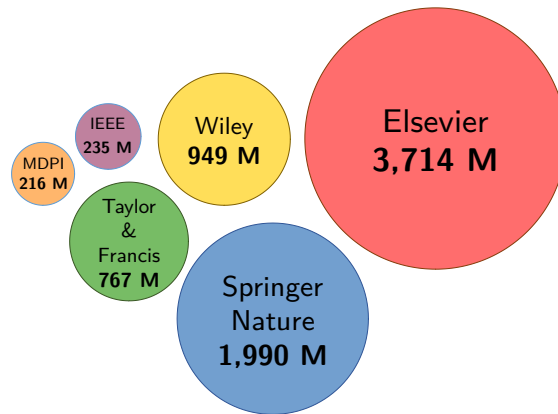


Figure 2: Revenues in 2020 of the biggest publishers in \$ [37, 38, 39, 40, 41, 42]. In spite of the health and economic crisis of 2020, the figures are representative of usual business years. Elsevier, Wiley, Taylor & Francis belong to larger groups with more diverse activities than publishing. The figures shown here correspond to the publishing segment only. MDPI does not publish its revenue, so the figure is only an estimation computed from the APC and the number of publications [43].

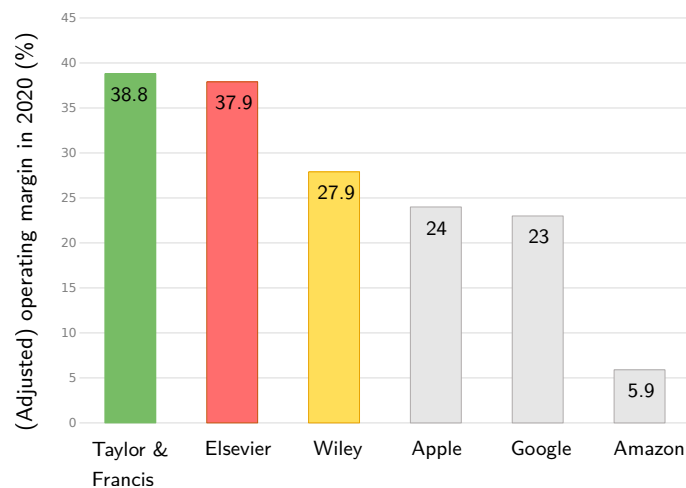


Figure 3: Operating margins in 2020 in % [44, 45, 46]. The operating margin is the ratio of the operating income (or profit) with the revenue. Taylor & Francis, Elsevier and Wiley publish an adjusted operating income which includes some technical corrections without changing the value substantially [47, 40, 38]. Springer Nature does not publish its operating profit because its shares are not traded on the stock-exchange.

largest OA publishers are MDPI (a fully OA publisher with 160k articles published in 2020) and Springer Nature (124k articles representing 33% of their publications) [39, 41].

The more prestigious a journal is, the higher the APC tend to be. Some examples are shown in Figure 4. Note that PLOS (Public Library of Science), although declared to be a non-profit association, applies very high charges.

Meanwhile, *Quantum*, a diamond open access journal (see section 2.3), has proved that it can run perfectly well, with high-quality standards, with a real cost per article

around \$200 [49]. Of course, the costs can vary a lot depending on criteria like the share of the work between scholars and publishers, the financial remunerations of the editors, or the rate of paper acceptance. *Quantum* can afford very little expenses because most of the editing process is taken care of by the academics themselves. But even without being in this case, conservative estimates show that the publication cost for a representative scholarly article is around \$400 [50].

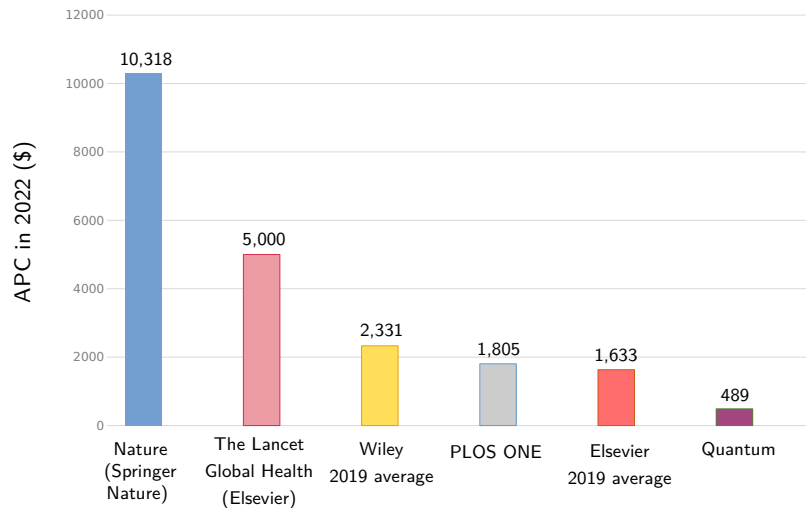


Figure 4: APC of some journals in 2022 in \$. The figures are taken from the official websites of the respective journals. The 2019 averages are taken from [51].

1.4 PARASITES OF ACADEMIC RESEARCH

The motto of Elsevier is *Non Solus*, Latin for ‘not alone’. According to Elsevier, it represents “the symbiotic relationship between publisher and scholar” [52]. ‘Symbiotic’ would mean that the relationship is based on mutual exchange with a balance of respective benefits. On the contrary, we show in this section that the activity of commercial publishers has become essentially parasitic and harmful to the progress of science.

KNOWLEDGE BEHIND PAYWALL Many scholarly publications are not freely accessible online. Only around 30% of all publications are open access [48]. The legal way to read an article behind a paywall is to pay, yourself a few tens of dollars or to be affiliated to a university that pays for a subscription. The price for a single article is obviously too high, considering that researchers must read dozens of such articles, without being sure of the relevance of the paper before having read it. So, the legal system is preventing the general public from reading specialised literature, and even some researchers cannot access the relevant literature when their university cannot afford the price [53]. Besides, the subscription to electronic materials implies licences, regulated by *contract law* which is a source of new threat for the rights of public libraries, compared to printed materials, governed by the standard *copyright law* [54]. This overall situation is clearly detrimental to the pursuit of knowledge.

THEFT OF INTELLECTUAL PROPERTY Most publishers require the signature of a copyright transfer agreement for the publication of articles [55]. This means that the authors give up the copyright of their own intellectual results. This allows big publishers to sue any pirate dissemination of articles in the name of the protection

of authors' rights, although most researchers would probably welcome the largest availability of their results [56, 57]. This situation concretely means that most of the results of the scientific research of the last century is the property of business driven publishers.

SPOILIATION OF PUBLIC MONEY Despite the high prices, many universities are still ready to pay for subscriptions or APCs. However, spending this enormous amount of public money is hardly justifiable when compared to the average service provided by the publishers. Indeed, most of the work necessary for the publication of articles is done by the researchers themselves, already paid by public institutions: doing the research, writing the article, editing and reviewing the work of peers. All of this is free work for the commercial publishers that make a profit from it. The cost is covered by public money allocated to the research groups in the form of national or international grants, or the standard ministerial budget disbursed by universities.

Historically, publishers took care of the editing (typewriting, display, spell check, etc) and printing, but nowadays the latter is not necessary anymore (the marginal cost of a digital copy is basically zero) while the former is mainly done by the authors themselves. What remains to be done by the publishers is maintaining a digital network (website, emails, servers, etc) and organising the peer-review, which has often been automated [35].

In an investment advisory report from 2005, the Deutsche Bank described the economic system as a "triple-pay" system, in which "*the state funds most research, pays the salaries of most of those checking the quality of research, and then buys most of the published product*" [13]. We can thus really speak of the spoliation of public money. This becomes an additional source of discrimination between richer and poorer universities, countries, or research fields. Publishing companies reach annual margins close to 40% [58, 13], which tops those of giants like Google, Apple or Amazon (see also Section 1.3). Such levels of margin are characteristic of monopolistic activities, and this fact touches the core of the parasitic activities of these companies. At a time when budget restrictions are impinging the health of scientific institutions, the citizens cannot afford such a spoliation of public money.

Although it was a fair answer to subscription paywalls, the promotion of open access since the beginning of the 2000s has proved unable to address this spoliation of public money. The Budapest Open Access Initiative (BOAI) was categorical about open-access, whilst remaining silent about the specific economic model that should support it. Open access has since gained a very large consensus, even among the commercial publishers who developed APCs. We now need to draw a new line of departure to impose fair models on much more stringent rules.

BREEDING OF SHARKS The current politics of most journals embrace a system of simple bibliometrics, above all the impact factor, as a surrogate for quality. However, there are clear arguments that this is harmful to research [59]. The competition between the journals encourages competition between researchers. This is just part of a larger environment of perverse incentives and hypercompetition that steers academia towards unethical behavior and, at a critical tipping point, corrupts the scientific enterprise and leads to a complete loss of public trust [60].

The current race towards high-impact journals influences the whole scientific publishing system. It is reinforcing a peculiar mode of production of research, taking the form of 'papers', while other modes like books, blog posts, videos, wikis, forum discussions, etc. could be valued as well.

Besides, the high-impact-factor journals have strong leverage on the scientific field they represent. They have the power to shape the direction of a field, but also to make careers [61]. This pressure forces many to endure an unhealthy working environment, or to leave academia entirely [62], and favours certain traits, filling

the upper ranks with super-producers or social climbers, rather than reflected, dedicated, deep-thinking researchers.

GROWING CONTROL OVER ACADEMIC LIFE Many of the big publishers currently enlarge their business activity by providing data analysis tools for scientific literature (like *Scopus* of Elsevier or the *Web of Science* of Clarivate). These tools are sold not only to universities but also to funding agencies or governments. When used as the basis for internal decisions, like the hiring process, the choice of research topics and financial planning, this will increase the power of business driven entities external to academia. The SPARC report warns: *“The move by publishers into the core research and teaching missions of colleges and universities, with tools aimed at evaluating productivity and performance, means that the academic community could lose control over vast areas of its core activities.”* [63]

This move pertains to a general strategy of vertical control that aims to gain power over more steps of the production stream. For instance, Elsevier has developed various online tools targeting many kinds of services: SciVal (evaluation), Scopus (bibliometry), Science Direct (repository), Mendeley (personal library management), Evise (edition).

2 | FREE, FAIR AND FUN

*An old tradition and a new technology have converged
to make possible an unprecedented public good.*

— Opening sentence of the BOAI declaration [64].

The current publication system, described in the first chapter, is detrimental to the pursuit of knowledge. It is necessary to make a radical shift happen.

Publishers have already anticipated the new trends, and have tried to shape them to protect their profits. To counter them effectively, we need to identify the obstacles that could be faced by the researchers themselves. First, it takes time and energy to change habits. Journals still perform some useful technical tasks, and it requires effort to devise working alternatives. More importantly, the power of current publishers stems from the historical roots of the journals they own, which have gained prestige over the years. Researchers are looking for symbolic status in the eye of their peers and superiors by publishing in renowned journals. Besides, the material conditions of researchers push them to ask for positions, promotions, and grants from funding institutions, which use the prestige of journals as a proxy to evaluate them.

Despite these difficulties, there have already been many attempts and partial successes to drive a new shift in scholar publishing. Many of them should be further developed and generalised. We expose them in this chapter and make recommendations addressed to the different actors.

2.1 REPOSITORIES AND SHADOW LIBRARIES

Like medieval copying monks who would have opposed Gutenberg's printing, pay-wall remains anachronistic to the digital revolution. Nevertheless, a few ways by which to bypass paywalls, legal or not, have become increasingly popular.

ARXIV The website [arXiv.org](https://arxiv.org) is an online repository where scientists freely store the preprints of their articles and make them freely accessible to anyone. It concerns mainly physics, mathematics, and computer science, where it has become an almost universal practice to post a version of a paper on arXiv. Since its creation in 1991, the number of submissions has grown exponentially. The total number of articles is approaching 2 millions, with a monthly submission rate of about 16,000. The arXiv is owned by Cornell University, and it has a budget of approximately \$2.6 million per year, funded mainly by Cornell University, the Simons Foundation and many other companies, societies, and universities [65]. Although arXiv was one of the first such repositories, many others have developed in other fields, such as Europe PubMed Central, CiteSeerX, and bioRxiv. The Confederation of Open Access Repositories (**COAR**) is trying to develop a global network of open access repositories with aligned policies and practices.

GUERRILLA OPEN ACCESS MANIFESTO Naturally, the ethical values of the early internet and hacker culture strongly influence the scientific community when it comes to sharing knowledge. Such ideas are reflected in Aaron Swartz's (hactivist and co-founder of Reddit) "Guerilla Open Access Manifesto" written in 2008 [66]. It starts with the words: "*Information is power. But like all power, there are those who want to keep it for themselves,*" and continues to name Elsevier as an example. Like this

report, Swartz offers basic ideas on what individuals can do to keep information free, and advocates guerilla tactics that would imply copyright infringements, but “*only those blinded by greed would refuse to let a friend make a copy*”.

In 2011, Aaron Swartz was arrested and prosecuted for having organised a systematic download from the JSTOR digital repository. The judicial proceedings led him to commit suicide in 2013.

SCI-HUB In 2011, the Kazakh researcher Alexandra Elbakyan created Sci-Hub, a website providing free access to millions of research articles that were behind paywalls. At the beginning of 2022, it hosts 88 million articles [67], which means the majority of all articles ever published [5]. It also receives more than 2 million search requests per day [68]. These numbers show that Sci-Hub is widely used by researchers and this is true whatever the level of wealth of their country. In the top-20 from countries using the service, one finds China, USA, France, Brazil, India, Germany, Russia, Iran, Vietnam [68].

The main publishers (Elsevier, Springer Nature, the American Chemical Society, John Wiley, Cambridge University Press, etc.) sued the website for infringing copyright laws. As a consequence, Internet service providers were forced to ban the website in many countries, like France, Germany, Sweden, and the UK. The European Commission included Sci-Hub in its “Piracy Watch List” [69]. There is an ongoing trial in India that opposes Sci-Hub to ACS, Elsevier, and Wiley. For the first time, Sci-Hub is defending itself in court because they could have a chance to win given India’s law [57]. The political question at stake is that of the balance between the right to property and the right to knowledge. Whatever the outcome of these trials, the large popularity of the website shows that it answers a global need for easy access to specialised knowledge.

LIBRARY GENESIS Created in 2008 in Russia, the Library Genesis is a shadow library that stores books, in addition to the scientific articles of Sci-Hub. By the end of 2021, it offered more than 8 million books, in many languages, including academic books, essays, novels, comics, etc. The main publishers have sued the website and internet service providers have been forced to block it in many countries including the UK, France, Germany, and Russia.

ZENODO The digital revolution has enlarged the set of possible formats of research outputs. It is precisely one of the features of the open repository **Zenodo** to accept all sorts of research files: publications, datasets, code, posters, etc. It was launched in 2013 by OpenAIRE, a program dedicated to the establishment of an online infrastructure to implement the Open Science policy of the European Commission. In 2021, it crossed the threshold of 2 million records.

RECOMMENDATIONS

- For universities, research institutions, research funders, and policy-makers, recognise officially the essential contribution of Sci-Hub, the Library Genesis, Alexandra Elbakyan and Aaron Swartz to the pursuit of knowledge. This symbolic recognition could take several forms like a formal declaration, giving official honour, creating a prize in their name, etc. More generally, defend activists who are sued for their actions in favour of the free access to knowledge.
- For policy-makers, fix as a general orientation the goal of developing a free and legal online platform to spread knowledge with a service quality as high as Sci-Hub or the Library Genesis. A first step could be the development of a multi-field and multi-lingual repository, on the model of arXiv, with easy bridges to other repositories. Then, action should be taken to allow the inclu-

sion of all past publications, starting with the research which was funded by public money.

- For internet service providers who are forced to block Sci-Hub, block in return the publishers who have sued Sci-Hub, as it was done by Bahnhof, a Swedish ISP [70].
- For researchers, refuse systematically to assign your copyrights to publishers. First, protect your work by choosing a Creative Commons licence CC BY when uploading your work on a preprint server. Second, demand an amendment of the publishing contract whenever it contains an assignment of your copyrights to the publisher. Otherwise, your research output becomes the property of the publisher until seventy years after the death of all authors. Publishers must cease to be the owners of knowledge. [35]
- For researchers, mention Alexandra Elbakyan in the acknowledgements of your articles, in a sentence like: “*The authors thank Alexandra Elbakyan for her help in accessing the scholarly literature.*”.
- For researchers, make sure the most up-to-date version of your articles is available on an open repository. The website dissem.in may help you in this task. Besides, in the reference section of your papers, always provide a clickable link to an open access version of the articles when it exists.

2.2 BOYCOTT

Researchers can refuse to collaborate with parasite publishers. Boycott can take several forms: refusing to review, to submit, or to be a member of an editorial board.

JOURNAL DECLARATIONS OF INDEPENDENCE In 1989, most of the editorial board of *Vegetatio* (Kluwer Academic Publishers) resigned and launched the *Journal of Vegetation Science* (IAVS and Opulus Press Uppsala). They protested against high prices and lack of control of the board over the journal. This became the first example of a “journal declaration of independence” [71]. Since then, many other boards have done the same. Unfortunately, in many cases, this has meant switching from one parasite publishers to another, with only better commercial conditions. Ideally, a declaration of independence should completely free the journals from parasite publishers (see section 2.3).

PUBLIC LIBRARY OF SCIENCE (PLOS) In 2000, a few well-known researchers in medicine and biology wrote an open letter calling for *the establishment of an online public library that would provide the full contents of the published record of research and scholarly discourse*. It added: *To encourage the publishers of our journals to support this endeavor, we pledge that, beginning in September 2001, we will publish in, edit or review for, and personally subscribe to only those scholarly and scientific journals that have agreed to grant unrestricted free distribution rights to any and all original research reports that they have published, through PubMed Central and similar online public resources, within 6 months of their initial publication date*. This open letter eventually gathered the signature of nearly 34,000 scientists [19]. But in August 2001, not much had changed in the publishing industry, and PLOS decided to establish itself as a non-profit with the aim of developing an open access publishing alternative [72]. In 2003, they launched their first journal, *PLOS Biology*. In 2006, they launched a multidisciplinary journal, *PLOS ONE*, with a peer-review only focusing on ‘*rigorous research and ethics rather than perceived impact*’ [19]. Despite the non-profit status, the publication fees of PLOS are very high (\$2,137 on average in 2019). PLOS has a publication fee assistance program for the authors unable to pay the publication

fees, but it is hard to evaluate the overall extent of this fee reduction. Hence the initial call for a boycott has turned into a publishing initiative with an economic model identical to that which private for-profit publishers have developed since then.

BEALL'S LIST Since the 2000s, the development of open-access models with APC has led to the appearance of fake journals. They look like academic journals but do not reach the same quality standards and are ready to publish any article for money. These were dubbed “predatory journals” by the librarian Jeffrey Beall, who started to maintain a list of them in 2012 [73]. The list soon became famous and was used by researchers to boycott these journals. Beall was put under pressure by the concerned publishers, who obviously perceived the list as a threat to their business. One publisher, MDPI, was removed from the list after intense lobbying: “*They tried to be as annoying as possible to the university so that the officials would get so tired of the emails that they would silence me just to make them stop.*” He finally removed the list from his website “*facing intense pressure from [his] employer, the University of Colorado Denver*” [74].

One should not get confused: Jeffrey Beall is a clear opponent of the open access movement as a whole, with or without APC, with or without good peer-review. He regards the predatory journals only as the metastases of a more generally harmful open access movement. Instead, he defends the traditional view of a free market where articles are private commodities [75]. Yet, his list can also be viewed as an alert calling for safeguards to the fair development of open access.

Beall was accused of labelling journals as predatory too easily, and there was a debate about what should be the discriminating criteria to consider a journal as predatory [76]. What this debate revealed is that the delimitation between predatory journals and standard journals is fuzzy, as there is a continuous spectrum of practices. Some have established lists of criteria to identify predatory journals, like *Think, Check, Submit*, but it sometimes looks like a desperate attempt for the big publishers to distance themselves from smaller ones. And the distinction is not easy as their business model is basically the same: charging the author for publication. Insisting on the notion of predatory journals is missing the issue with commercial publishers. For that reason, we prefer to talk of parasite publishers, which certainly includes predatory publishers, but also any publishing company that makes huge margins from public funding. This notion appears much clearer than predatory, and it points more directly to the source of threat to science.

THE COST OF KNOWLEDGE In 2012, the Fields medal winning mathematician Timothy Gowers published a blog post in which he declared publicly that from then on, he would refuse to publish, referee, or be part of any editorial board in a journal owned by Elsevier [77]. He encouraged other scientists to do the same and was joined by many renowned scientists. The movement has taken the form of a website, *The Cost of Knowledge*, where nearly 18,000 researchers have signed the call for the Elsevier boycott.

PROJEKT DEAL In Germany, a coalition of about 200 universities and research institutes, the *Projekt DEAL*, was formed in 2014 to negotiate fair deals with libraries. The criteria are immediate publication in open access with permanent full-text access and a fair and reasonable pricing model. It is an example of a *transformation agreement*, which shifts the subscription-based reading (free publication, pay for read) to an open-access model with APC. Although deals were concluded with Wiley in 2019 and Springer Nature in 2020, no deal could be reached with Elsevier [78]. Since 2018, all subscriptions with Elsevier have been cancelled. Such a decision has met the support of the German scientific community.

Other countries, like Norway or Sweden, are following a similar strategy [79]. In France, the consortium Couperin, which negotiates in the name of many French

institutions, has reached an agreement with Elsevier. In spite of partial successes in the negotiations, it is disappointing that a 12-month embargo is still required before the publications are made open-access [80]. Thus, transformation agreements are very imperfect solutions which do not tackle the problem at its roots. They manage to obtain some improvements, but do not question the legitimacy of the power of commercial publishers.

RECOMMENDATIONS

- For libraries and consortia negotiating deals with the publishers, consider the termination of subscription contracts a serious option. In Germany, such a decision has received the support of scholars.
 - For researchers, join the boycott of Elsevier and make your choice public by signing on [The Cost of Knowledge](#).
 - For researchers, refuse to review articles in commercial journals. Answer to the inviting editor as: *“Thank you for contacting me. However, I am sorry to decline the invitation. This journal is owned by a publisher taking illegitimate profit on the work of scientists paid by public money. I prefer to dedicate my time to help fair and free journals like (pick your favourite diamond journal, see below). For more information on this topic and the ways you could tackle the issue as an editor, please take a look at the report of the BRCP.”*
 - For researchers, stop congratulating colleagues on the basis of having published in journals of high-impact factor.
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2.3 CREATING FREE JOURNALS

The publishing system is currently undergoing many rapid changes. Scholars should take this as an opportunity to trigger a transition towards a fair model. There are already examples of concrete alternatives that can serve as guides. These seeds should be multiplied, sowed and grown.

DIAMOND OPEN ACCESS. In 2012, in the wake of the Cost of Knowledge initiative, the name of *‘diamond open access’* was suggested for journals based on the following principles [35]:

1. The authors do not have to pay to publish.
2. The articles are published under the [CC BY licence](#). This means that re-users are free to share and adapt the material, so long as attribution is given to the creator.
3. The editorial board, made of voluntary researchers, is the legal entity which owns the journal. The publisher is only a service provider under contract with the editorial board.

This name distinguishes the model from *‘gold open access’*, which is used for open access with an APC. A recent study has shown that the diamond ecosystem in 2021 is representing 8 to 9% of the total number of published articles in the world [81]. Diamond open access has become the standard of [Redalyc](#), a large network of Ibero-American scientific journals. Beginning 2022, some important research organisations (ANR, cOAlition S, OPERAS, and Science Europe) have released an Action Plan, openly advocating for a general transition towards the diamond model [82].

THE FREE JOURNAL NETWORK This is a non-profit corporation promoting scholarly journals running according to the **Fair Open Access Principles**, which can be regarded as a variation of the diamond open access principles. The **Free Journal Network** already contains 69 journals ranging from mathematics to linguistics. For example:

- **Glossa** was founded in 2015, after the full editorial board of *Lingua*, owned by Elsevier, resigned. “From 2021 onwards, long-term funding is provided by the Open Library of Humanities (OLH). Authors are only asked to financially contribute if they have access to institutional funding or grants for this purpose.”
- **SciPost** was founded in 2016 by Jean-Sébastien Caux on the basis of a sharpened version of Fair Open Access Principles, called the Genuine Open Access Principles: community ownership, open infrastructure, copyright to authors, open access, open citation data, no fee, non-profit, open finances, academic editing [83].
- **Algebraic Combinatorics** was founded in 2017, after the four editors-in-chief of the *Journal of Algebraic Combinatorics*, owned by Springer, collectively quit in order to protest against the large subscription fees and high APCs. It is supported by a network of universities, laboratories and libraries around the world.
- **Quantum** was founded in 2017, addressed to the quantum physics community. It is registered as a non-profit association based in Austria. Their costs are minimal and they practice open-accounting. Financially, it relies on the support of laboratories like IQOQI Vienna, voluntary APC contributions, and donations. Such a success story has been made possible by the existence of a strong community committed to supporting and publishing in the journal.

PUBLIC PUBLISHING PLATFORMS. One of the main challenges for the multiplication of such free journal initiatives is funding. A rough estimate of the real cost of publication is \$400 per article [50]. In the examples above, this cost is covered either by permanent support of institutions or low APC, based on the principle that rich laboratories pay more to allow waivers for poor ones. Considering that the priority for the academic community is to take back the control of their journals, we would encourage either means of financing. However, in the long term, we believe that permanent public funding should be preferred as it pushes further the idea that journals and articles are not private commodities but public goods.

There is a need for public organisations dedicated to the funding and development of diamond journals. In France, the *centre Mersenne* is moving in this direction for scientific journals. In the field of humanities, *OpenEdition* provides similar services. Both are supported by French public institutions, like universities, research agencies and the Ministry of Higher Education and Research. Such public publishing platforms should be regarded similarly to any other research infrastructures, as necessary tools for the pursuit of research. The required efforts amount to about 2% of the research budgets. It should be integrated into the internal operating fund of public research, instead of externalised to an economic market.

RECOMMENDATIONS

- For universities, research institutions, research funders, and policy-makers, support the creation of free journals by providing administrative and financial long-term investment. Some institutions like Cornell University or IQOQI Vienna are already contributing to the shared financial effort by supporting *arXiv* and *Quantum*, respectively. A more systemic proposal could consist in the creation of a centre dedicated to offer legal, technical and financial support to editorial boards willing to emancipate their journals.

- For researchers, check the list maintained by the Free Journal Network. Whenever there exists a free journal in your field, prefer to publish there. This recommendation is especially targeted to established researchers whose reputation is already cemented.
- For the editors of journals owned by parasite publishers, resign collectively and create an alternative free journal. Take inspiration from the *Proposal for editorial boards about emancipating their journal* by the MathOA foundation [84].
- To the DOAJ, separate more clearly APC journals from diamond journals. Moreover, include the latter more systematically: in 2021, only a third of diamond journals were indexed in the DOAJ [81].

2.4 INSTITUTIONAL REGULATION

The publishing system is intertwined within a larger system of academic production. The necessary change of the former is, to some extent, conditioned to more structural changes of the latter. The global publishing market of about \$28 billions should be compared with the world gross domestic expenditure on R&D which was \$1,767 billions in 2018 ([85] p. 73). Individual researchers or local initiatives can certainly impulse decisive moves, but they need to be scaled up by institution regulations to transform into a global shift.

DORA The *San Francisco Declaration on Research Assessment* (DORA) [22] was originally initiated by the American Society for Cell Biology and later found wider support in the scientific community. As of 2021, more than 20,000 individuals and organizations have signed the declaration that primarily suggests not to make quality assessments in science based on the impact factor of a journal. It states that *“the scientific content of a paper is much more important than publication metrics or the identity of the journal in which it was published.”* The content of this statement is not controversial and the need to have it stressed reflects the critical state of academic publishing and quality assessment.

The DORA declaration is far from being sufficient. Some institutions, such as the HCERES in France, devoted to research evaluation, have officially signed DORA, but in practice continue to indulge in irrelevant metrics and bureaucracy [86].

UNIVERSITIES OF GHENT AND UTRECHT Some universities are trying to implement the principles of the DORA. In 2018, the University of Ghent in Belgium announced that it would change the way it evaluates its faculty. Rector Rik Van de Walle wrote *“No more procedures and processes with always the same templates, metrics and criteria which lump everyone together. [...] Ghent University is deliberately choosing to step out of the rat race between individuals, departments and universities. We no longer wish to participate in the ranking of people.”* [63]

More recently, the University of Utrecht announced that it would stop using the impact factor and would promote instead a set of other standards ranging from education to teamwork commitment [87]. This is part of a larger movement of Dutch universities that have all signed in 2019 a common position paper, *‘Room for Everyone’s Talent’* [88]. It declares *“Among other things, this means that bibliometric publication indicators (h-index, journal impact factor) will no longer be requested and that the inclusion of research output on curricula vitae and application forms will take on a more narrative character.”*

PLAN S This is an OA publishing initiative launched in 2018 mainly by European funding agencies, but also joined by the World Health Organization or the Bill & Melinda Gates Foundation. If scientists receive funding from an agency that is

part of “cOAlition S”, their results must be published in journals that meet certain standards, including open access, authors retaining their copyright under a creative commons licence or similar, and APCs capped and adjusted to also include low-income countries. The cOAlition S is facing the difficulty of finding a good balance between demanding goals and the need to meet world-wide support. It is perhaps regrettable that plan S does not favour the idea of direct public subsidy to non-commercial publishing platforms. Yet, its first steps were enough to meet resistance from major publishers, and also from some researchers who criticise its practicability [89].

RECOMMENDATIONS

- For universities, research institutions, research funders, demand the results of research to be published in diamond open-access journals.
 - For universities, research institutions, research funders, and policy-makers, step back from the use of bibliometric indices to evaluate research and researchers. The 2022 [Paris Call on Research Assessment](#) goes in the right direction, but it could certainly be pushed further by questioning the very goals of research assessment.
 - For universities, research institutions, research funders and policy-makers, support long-term funding and permanent positions instead of short-term contracts and funding by project. This requires the rejection of the New Public Management that attempts to run academic research like a lucrative business.
 - For universities and research institutions, define precise data policies to regulate the use of bibliometric tools and prohibit publishers from reselling data to funding agencies or other third parties. See the SPARC report [63].
 - For policy-makers, impose legislation that restricts and regulates the commercial use of data by publishers [63].
 - For the World Intellectual Property Organization (WIPO), urge a revision of the Berne Convention and the WIPO Copyright Treaty to ensure maximal accessibility to the results of research on the basis of the 27th article of the Universal Declaration of Human Rights. Copyright treaty should make accommodation to any work that has been subsidised by public money. This move is necessary to align international law on the 2021 UNESCO Recommendation on Open Science [90]. In 2018, the Global Network on Copyright User Rights has made a proposal for a Treaty on Education and Research Activities that pushes in the right direction [91].
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CONCLUSION

*anyone, whether he be rich or poor,
may ask and answer me and listen to my words*

Socrates in *Apology*

The current publishing system is founded on the premise that articles and journals are private commodities, and thus sources of profit. There is a strong consensus in the academic community that this system is dysfunctional and hinders the scientific endeavour on many different levels. There is nothing more telling than realising that the big publishing houses make profit margins that outperform big-tech companies. Nothing can justify this private control over the outcomes of research that is largely funded by public institutions. We strongly believe that articles and journals should be brought back into the public domain.

The open access movement has won partial victories in this direction. Repositories like arXiv or shadow libraries like Sci-Hub have made most of the literature universally accessible. However, the publishing companies are also adapting their business model to secure their profit. First, they promote open access with article processing charges, therefore carrying on the spoliation of public money. Secondly, these companies are moving towards new profitable market segments like data analysis services, which could strengthen their control over the whole chain of knowledge production.

Moreover, the current system promotes a culture where researchers end up being selected by quantitative indices that rarely reflect the quality of their work. This creates hypercompetition –*publish or perish*– where those selected for powerful positions under-represent the values associated with a healthy work environment. Indeed, for most researchers, their scientific careers and the publishing system are so entangled that the system also undermines their personal lives and health. Besides, the economic anxiety of researchers and the implementation of capitalistic management methods jeopardise the quality of the produced research. Thus, the task of building a better publishing system cannot be separated from questioning the larger context of the production of knowledge.

We have examined many initiatives that were pushed forward to build better practices. Most noteworthy, some communities of researchers have already operated a bifurcation of their publishing habits and demonstrated the sustainability of diamond open access journals. They must be supported more widely by public institutions as they could serve as seeds to scale up the feat.

The future of academic communication has yet to be invented. The current system only sees scientific and economic value in the traditional format of peer-reviewed articles. This old custom is blind to the many potentialities offered by the digital revolution. So, the promotion of diamond open access should come with a more general reassessment of the means and purposes of the scientific endeavour. New paths must be open for knowledge to spread more widely across humanity.

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