

## Need for a change in scientific publishing

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### Abstract

Outsourcing of scientific publishing to scientific journals is problematic, both economically and academically. It is expensive, slow, non-transparent, unbalanced and excluding. Academic library subscriptions contribute substantially to the publishing companies' 30-40% profit. There is general consensus that scientific reports should be openly accessible on the Internet. This is generally not the case with articles published in the traditional scientific journals. Open access journals are multiplying fast, and are of variable quality. Although, for science and scientists, publishing in open access journals is in total less expensive than journal subscriptions, the article processing charges (APC) of open access journals are still high (up to 5,000 USD) and should be reduced. Science is expensive, publishing science should not be.

The impression the present system conveys, with its editors and anonymous reviewers, of quality and objectivity, is partly an illusion. The basis for decision on manuscripts is too thin and the balance of power is too uneven.

Instead of a complicated fallible system, a simple fallible system is suggested: web-based, indexed and searchable repositories funded and organized by accountable and non-profit institutions/organizations where researchers may upload reports that have been thoroughly reviewed by and are supported by one or more competent, impartial, unbiased and named expert peers chosen by the authors themselves. After publication, reports may be further openly evaluated and commented online by named researchers in the field. Article processing charges should be moderate. Such a system would be simple, reasonable, fast, transparent, balanced, including, efficient, and adequately quality assured.

### Keywords:

Scientific publishing; open access; peer review; new system

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## Introduction

Scientific publishing has gone from being controlled by science/scientists to being controlled by a commercial publishing industry (Fyfe et al. 2017). This is problematic, both economically and academically. The need for a change is becoming increasingly evident and voiced (Schekman 2013; White 2014; Schmitt 2015a; Tracz 2015; Tracz & Lawrence 2016), but the system is so established and comprehensive that it may seem difficult to transform. In a way, science is hostage to a structure it itself created, and which is not easy to escape from. Here, some of the problems of today's system are discussed and a possible way out is suggested.

## An expensive publishing service

Scientific publishing has not only become big in terms of number of journals (about 28,000 scholarly peer-reviewed English-language journals) and number of articles published per year (about 2.5 millions) (Plume & van Weijen 2014; Ware & Mabe 2015), it has also become big business. In an article in *The Guardian* Stephen Buranyi (2017) points out the uniqueness of the business model: the publishers pay nothing for the raw material (manuscripts/research) and sell the slightly processed product (scientific journals/articles) back to those who produced the raw material. So, research institutions, mainly public, finance the research, pay the researchers who produce the research, pay researchers who function as editors, pay researchers who review the manuscripts for free, and then buy the increasingly expensive scientific journals (Lahti 2016). It is a kind of vicious circle. In 2015 the annual revenue of this branch of the publishing industry was 25.2 billion USD with a profit of 30-40%, comparable, for instance, to Apple (Schmitt 2015a,b). About 40% of the revenue, i.e. 10 billion USD, comes from scientific journals, of which about 75%, i.e. 7–8 billion USD, stems from academic library subscriptions (Morrison 2013; Schimmer, Geschuhn & Vogler 2015; Ware & Mabe 2015). It is allowed to earn money and make a profit, but it is unwise to spend money unnecessarily. It is, however, necessary to ask if scientific publishing may be organized differently, i.e. in a way that serves the needs of the community, science, scientific institutions and scientists, rather than the publishers who publish scientific journals.

## Questionable quality assurance

It is not only economical considerations that call for a re-evaluation of scientific publishing. Also the way in which submitted manuscripts are received and treated in the journals, is problematic. Journal editors evaluate the manuscripts, which, if judged worthy of additional evaluation, are forwarded to reviewers, i.e. other researchers in the field, for so-called peer review. The main argument for publishing research reports in today’s scientific journals is precisely the notion that the evaluation performed by editors and reviewers will assure the quality of scientific publishing and of science; manuscripts can be corrected and improved and those that do not fulfil scientific standards, can be weeded out.

The influx of manuscripts to scientific journals is large, driven by a heavy publication pressure linked to prestige and career goals among researchers, cf. the expression “publish or perish” (Fyfe et al. 2017; Plume & van Weijen 2014). When prestige and career in academia to a large extent is governed by the number of published articles and by the journals’ “impact factor”<sup>1</sup>, researchers will adapt to the system, resulting, for instance, in articles with many authors (Larsen & von Ins 2010; Lozano 2013; Plume & van Weijen 2014), often with unclear contributions. It has been shown that a small “elite” of 1% have their name on 41% of all articles and on 87% of the most cited articles (Ioannidis, Boyack & Klavans 2014).

The capacity of the traditional scientific journals is limited. Consequently, the editors have to reject many manuscripts. In such a situation, the criteria and basis for rejection may be somewhat unclear, with a possibility of being influenced by trends, personal taste and impact factor considerations, and with little considerations for the time and resources put into the research. A negative comment from a reviewer can be a welcomed pretence for a rejection, with little or no possibility for a real and fair discussion about the grounds for the rejection; in this game the reviewer appears to be the editor’s preferred co-player, not the author(s). Thus, oddly enough, researchers may seem to be judged more trustworthy in the role as reviewer than in the role as author. Reviewers are of highly variable quality and anonymity may tempt some to indulge in negative criticism and sarcasm. Reviewers should not primarily serve the scientific journals and their editors, but rather science and the scientific community. Ideally,

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<sup>1</sup> “Impact Factor” is a somewhat imprecise measure of popularity/quality for scientific journals. For a given year it gives the mean number of citations received by articles published in the journal the two preceding years. For instance, if a total of  $x$  articles are published in a journal in the years 2015 and 2016 and receive  $y$  citations in 2017, the impact factor of that journal in 2017 is  $y/x$ .

manuscripts should only be rejected due to inferior quality, not due to limited publication capacity or bad or incompetent reviewers.

Examples of the doubtful contributions of reviewers are many, for instance this from Smith (2006):

Reviewer 1: *“I found this paper an extremely muddled paper with a large number of deficits”*

Reviewer 2: *“It is written in a clear style and would be understood by any reader”*

And from my own experience:

Reviewer 1: *“The study is not well planned, and Me&M and statistical analysis lack rigorous procedures”*

Reviewer 2: *“This is an interesting and well presented study that contributes to a better understanding ...”*

In both cases, one of the reviewers may be right, but hardly both. The point is: should a few anonymous peers be a decisive factor in determining the publication fate of a research report? Although many editors and reviewers do a decent and conscientious job within the frames of the present system, the basis for decision on manuscripts is too thin and the balance of power is too uneven. It is a problem for science that many manuscripts are rejected. Important results can remain unpublished because of ill-founded rejections. Time and resources have been invested in the research. Additional time and resources may be put into a new publication attempt, where authors must abide by another journal's specific and rigid rules for formatting and presentation. The present system, where one is forced to comply with the scope, preferences, and format of the journals, may be an undue hindrance for research. Consensus about research quality in relation to suitability for publication is not always attainable, as witnessed by variable reviewer reports and by examples of rejected manuscripts that should have been published (MacDonald 2016) and published manuscripts that should have been rejected (Bergstrom & West 2017; Faulkes 2018). Thus, a system where authors choose their own reviewers may function just as well as reviewers selected by journal editors.

A symptom of the increasing struggle for publishing, preferably in high ranking journals, but also for avoiding rejection, is the emerging and growing manuscript-editing services offering authors help in manuscript preparation and improvement (Kaplan 2010; Lozano 2014). Services range from simple proof-reading to in-depth scientific scrutiny and with costs ranging from a few hundred to several thousand USD. Although this

practice may be helpful in improving manuscripts, it raises questions about author contribution and it raises the costs of publication.

It may be tempting and convenient to leave evaluation and publishing of research reports to a few, as in today’s traditional system of scientific journals with its editors and reviewers. However, this outsourcing has its price, and the price is too high. It is costly, slow, non-transparent, unbalanced, excluding and unnecessary. The impression it conveys of quality and objectivity is partly an illusion. New times with new possibilities allow new solutions.

### Open access – fine, but still expensive

An increasing part of all types of communication takes place on digital media. Also the traditional scientific journals, that originated in the “paper age”, have become accessible on the Internet, but only through purchase of single articles (10–35 USD per article) (Porter 2012) or through costly subscriptions. With the emergence of digital publishing and a publicly accessible Internet, it has been a natural process to make scientific articles freely accessible on the net, so-called “open access”. The wish and demand for free access to research reports on the Internet has broad national and international support, both by academic institutions, e.g. Open Access 2020 (ref.) organized by Max Planck Digital Library, and by public authorities; in 2012 the European Union (EU) issued recommendations for improving access to scientific information (see <https://ec.europa.eu/digital-single-market/open-access-scientific-information>). As a consequence of the increased interest in open access, the publication pressure among researchers, and the limited capacity of the traditional journals, there has emerged an extensive undergrowth of digital journals practicing free access to their articles on the net, but which, on the other hand, demand an article processing charge (APC), or publication fee, from the authors for accepted articles. The fees vary, from 0–5,000 USD, often in the range 1,000–2,500 USD (Directory of Open Access Journals (DOAJ); Morrison 2013), probably depending on popularity and presumed quality. The traditional journals have embraced this trend to some degree by offering authors the option of having their article freely accessible on the net, but at a cost, i.e. a fee (1,500–5,000 USD), meaning that one in reality pays double, both the institution’s subscription and the fee for release of the article. Today’s open access journals – many with high publication fees, and many of undoubtedly doubtful quality – is not the solution for scientific publishing. The website

Beall's list (ref.) presents a list, a long one, of non-serious open access publishers/journals, so-called predatory publishers/journals, which seem more interested in collecting APC than in promoting good quality research. However, DOAJ's list of reliable open access journals is probably more reliable than Beall's list of unreliable journals. Examples of good quality open access journals are for instance PLOS, BioMed Central, PeerJ, eLife, and Frontiers, but, still, with publication fees in the range 1,000 – 3,000 USD. Based on the present global scientific journal subscription spending, the price per published scientific article is about 4,000–5,000 USD (Morrison 2013; Schimmer, Geschuhn & Vogler 2015), which is higher than the APC demanded by many open access journals. Therefore, it seems profitable to support a process toward open access publishing. However, a 1,000–2,500 USD APC is still expensive and may be unduly discriminating towards researchers with small budgets. It should be possible to establish a less expensive system for publication of research reports. Research is expensive and time-consuming. Publishing research should not be.

Because access to scientific journals is restricted and expensive, some researchers with a genuine need may not have the possibility or the means to read or download the articles. However, the solution to this problem represented by the website Sci-Hub (ref.) is illegal, unacceptable and unethical; it provides free access to most scientific journals by bypassing copyrights and subscriptions through proxies in institutions with access. They operate through several servers, e.g. sci-hub.mu, sci-hub.ooo, sci-hub.tw.

Social researcher networks like ResearchGate (ref.) and Academia.edu (ref.) allow open access to published articles that have been uploaded by member researchers, but the practice has been challenged by publishers (Chawla 2017).

Institutional and national repositories may archive digital scientific contributions of its academic staff, e.g. in Norway through uploading in Cristin (a Current Research Information System) and dissemination in the various institutional archives in Norway. However, these repositories are not intended as publishing platforms.

## Outline of a new strategy

It is high time that a new and modern regime is established for publishing research reports. An inexpensive, fast, transparent, more balanced and

including system on the terms of science and researchers. It may look something like this:

- Web servers are established, institutional, national or regional, where research reports can be uploaded and published. The seriousness and quality of web servers should be guaranteed by accountable authorities/institutions/organizations, for instance a university or national research council.
- Reports may be of different types, scopes and lengths. Rules for formatting, style and presentation should be general, liberal and flexible. In order to simplify formatting, tables and figures can be placed at the end of the manuscript, after the text part. Manuscripts are uploaded as PDF or Word files. Word files may be converted to PDF by an embedded program. Data files may be uploaded separately.
- In order to secure quality and seriousness, each manuscript should be approved and supported by at least one named peer chosen by the author(s). The authors probably know best which researchers have competence within the field. Supporting peers shall acknowledge that the manuscript satisfies the requirements for publication, concerning quality, reproducibility, and presentation. They may provide comments with the manuscript, not to be published, but as an aid for the editors (see below). Manuscript support should be based on a thorough examination of the manuscript and on a clarifying and correcting discourse with the author(s), i.e. a real peer review. It should have a meriting value and may possibly warrant a moderate fee. There should be no conflicts of interest and no close bindings between author(s) and reviewer(s).
- The author(s) and supporting peer(s) should be registered with Orcid (ref.) and must be affiliated with institutions of adequate international standards where the staff’s academic/scientific competence is evaluated. For young, non-merited researchers without such registration or affiliation, it suffices that the supporting peers have that.
- As an extra quality measure, the manuscripts, with the attached comments from the supporting peer(s), should be controlled by a few highly competent and paid editors employed for fixed terms (1-3 years). The editorial office should verify the authenticity of the author(s) and supporting peer(s), and the competence and impartiality of the latter. Health related research may need additional control measures.
- On acceptance, the authors should pay a reasonable APC for operation and servicing of the system, which is non-profit, for instance in the

order of NOK 1000-3000, USD 150–400, EUR 150–400. Residual financing should be provided by the accountable authorities.

- All articles should be freely accessible and downloadable on the Internet, with an international license, i.e. Creative Commons CC-BY.
- After publication, other researchers should be welcomed to comment on the article. They should be registered with Orcid. They may also grade the articles on a scale, e.g. 1–5, 1–6, 1–10, which will contribute to a differentiation between the articles and call attention to the more important ones. Based on the comments from other researchers, the author(s) may post a revised version of the article. The revised version should be so identified.
- The articles should be indexed and searchable, preferably in central services like Google Scholar, Scopus, and Web of Science, and should also be linked to information about number of readings, downloads, citations, and evaluation grade.
- The articles should be associated with international integration systems aimed at linking data and literature, e.g. Sholix (ref.).
- Each article is given a digital identity in an agreed international system, DOI (ref.) (Digital Object Identifier), which is a kind of barcode for digital documents.
- The unit that serves the system should also secure backup storage of the articles, both in digital and paper format.

## Preprint servers – and F1000Research

A system resembling to some extent the one outlined above exists already in the form of so-called preprint servers, the two most popular being arXiv (ref.) (physics, mathematics, computer science) and bioRxiv (ref.) (biology). Here research reports can be uploaded for free and be freely accessible on the Internet. A mild form of editorial control is applied in order to take out non-serious contributions, but there is no peer review. The purpose and advantage of the system is twofold: 1) fast exposure of research reports, and 2) possibility of feedback from peers before the manuscript is submitted to a traditional journal for publication. Many, but not all journals, accept that submitted manuscripts may have been prepublished on preprint servers.

Other platforms providing preprint services are for instance Authorea (ref.), OSF Preprints (ref.), PeerJ Preprints (ref.), and Zenodo (ref.). A

comprehensive list of preprint servers is presented at Research Preprints (ref.).

There is one open access publishing platform that comes close to the system suggested in the present paper, i.e. F1000Reserach (ref.). Its article processing charges are fairly moderate, i.e. USD 150 (<1000 words), USD 500 (1000-2500 words), 1000 USD (>2500 words), 2000 USD (>8000 words). It offers fast editorial basic scrutiny, subsequent immediate publication with indexing in Google Scholar, post publication reviewing by peers suggested by the author(s), subsequent indexing in central indexing services like Scopus and PubMed if the article receives two “Approved” statuses or one “Approved” and two “Approved with Reservations” statuses from reviewers, and post publication commenting by readers. Revised versions can be submitted. However, it may take a long time (months) before peer reviews are obtained. In addition, there is a rather cumbersome editor-mediated dialogue with reviewers online that others really do not need to be encumbered with and that would better have taken place on a private basis between author(s) and reviewer(s) ahead of submission. This will be the case in the system suggested above. When a manuscript is submitted, it has already been through an in-depth and thorough peer review by and discourse with the supporting peer(s). Comments and/or gradings by other researchers will add to a comprehensive evaluation of the research reports.

### **An affordable, serious, quality secured, transparent, efficient and functional system**

It is imperative that basic seriousness and quality is assured for the suggested publishing system. This is the function of the supporting peers and the editors. Their role is not to call attention to the few excellent research reports, but to promote the many that are good enough. Differentiation based on quality and importance is achieved by the commenting researchers and by the report’s significance and fate in the universe of science. With adequate indexing and searchability, researchers can easily find the articles that are relevant to their own research and then contribute to their evaluation by comments and grading. This will promote an increased degree of awareness, responsibility, interest and involvement on the part of the readers in their encounter with and use of published articles. Another decisive requirement for a well-functioning system is complete openness and transparency at all levels: authors, supporting

peers, editors and commenting researchers must contribute under full name and affiliation. Transparency will restrict undue cooperation and nepotism and will make it difficult to support research reports that are of inferior quality, premature or non-serious. With less time spent on publication, more time can be spent on research; knowing that publication in the new system will be fast and efficient, researchers can allow themselves to be more patient and thorough in their research and avoid pressing on with premature reports. A simple and straightforward publication platform as the one suggested here, without undue limitations in publication capacity, will also allow more room for research presenting negative results and for research reproducing and verifying or contradicting earlier research. A system like the one outlined here will also make non-serious open access journals superfluous. In addition, the system will secure the authors' and institutions' ownership to the research reports, which is not the case in today's traditional scientific journals.

Additional quality assurance is obtained by limiting the access to the publishing platform to authors and/or supporting peers who are registered with a research register, e.g. Orcid, and who are affiliated with institutions/enterprises of adequate international standards where scientific competence is evaluated for engagement/employment. This means that there is a possibility for a mutual utilisation of one's evaluations, i.e. evaluation for publication and evaluation for engagement/employment.

The quality of a research report should not only be judged by an editor and a few anonymous peers, but in full openness by the scientific community itself. Comments and gradings from other researchers, and number of readings, downloads and citations will contribute to clarify which reports are the more important. Competition can be important and may promote quality. In a system like the one outlined here, the competition for quality and importance in science will be more real and relevant than the competition the plays out in the fight for publication space in specific journals. The frame of reference should be science itself, not journal preferences. In the end, it is the quality and content of an article that determine how important it is and will be, not where it is published. To ignore the name and prestige of the publishing channel in research evaluations is a main issue in the San Francisco Declaration on Research Assessment (DORA 2012). Also, high rejection rates in scientific journals should not be considered as a positive attribute of today's system, since, evidently, many sound research reports are rejected, but rather as an expression of a system that does not function adequately. The fact that most

of the initially rejected papers eventually get published in other journals (e.g. Wijnhoven & Dejong 2010; Okike et al. 2012; Holliday et al. 2015), does the present system no credit; the papers could have been accepted in the first place, after due reviewer-induced improvements, saving time and efforts better spent.

Why would a publishing platform like the one suggested here attract authors and reviewers in competition with the existing journals? There are, of course, the many positive attributes, i.e. simple, inexpensive, transparent, fair, and efficient, but important also is that it is guaranteed and funded by accountable authorities/institutions/organizations on a non-profit basis. This adds to the seriousness of the system and emphasizes that its only rationale is publication of sound science that will be openly accessible.

## Supporting peers and peer reviewing

Peer reviewing is central to scientific publishing. As mentioned above, it is far from perfect and does not guarantee a fair judgement of research reports. However, there is general consensus that it does science more good than bad. The problem is to find the best strategy for it to function as adequately as possible (Birukou et al. 2011; Kovanis et al. 2017). However, since any system with peer reviewing will be fallible, due to its less than perfect participants, why not make it a simple fallible system instead of a complicated fallible system. The virtue of science and scientific publishing may be adequately guarded with at least one supporting peer and an editor at the entrance and with the whole scientific community in the commenting room.

The supporting peers hold a key position in the above suggested system. In this system it is up to the author(s) to find and approach the reviewer(s). Possible candidates for peer reviewing may be identified by consulting the manuscript’s list of references, among colleagues at conferences, and by searching indexing services like Google Scholar, Scopus, Web of Science and PubMed. On the web site Publons (ref.) reviewers with variable experience within different fields are listed. After having located potential reviewers, the tricky part may be to persuade them to do the job. One would think that the higher the quality of the research report, the easier it will be to find willing reviewers. Once a willing reviewer has been found, i.e. a reviewer who finds that the research is basically sound and worthwhile evaluating further, a discourse between reviewer and author(s) can be kept on a direct, personal and informal level, without exposure to editors and to

an online audience. In that way reviewing can be fast, honest, straightforward, and thorough. If necessary, additional reviewing assistance may be sought. A research report can take many acceptable forms. The task of the reviewers is to improve the authors' version, if generally acceptable, by pointing out errors, misunderstandings and deficits.

In this system lies an incitement for authors to present high quality research. For supporting peers, the incitement for reviewing lies primarily in the opportunity to support sound research and to broaden their own knowledge, but also in earning the merit of being published as supporting peer and possibly earning a moderate fee. The proposed system may give increased credit and prestige to reviewing, a much needed boost, since the present burden of peer reviewing is very skew, with 20% of the researchers doing 69-94% of the reviewing (Kovanis et al. 2016).

With time, a data base of peer reviewers within various research fields can be built based on the peer reviewers published in the system. This will be of help for authors in finding, choosing, and approaching peers for review of their research reports.

### **Somebody has to start – Just do it!**

The problem is: somebody has to start. Scientific publishing seems to constitute a rather inert structure. It is not easy to change a practice which the scientific community has lived with for hundreds of years. Much of the self-understanding of the researchers and the research community is linked to publishing in scientific journals, with its obvious connections to academic career and prestige. This system was acceptable when there were no other alternatives. Such an alternative exists today: open access digital publishing. Instead of an expensive, time-consuming, non-transparent, unbalanced and excluding system, we can now implement a reasonable, fast, transparent and including system.

The strategy chosen by EU, and supported by Norway, to promote a transition toward open access publishing, is to try to force the publishers to fully implement such a model by demanding that after January 1st 2020, research financed by them should only be published in open access journals, the so-called Plan S (2018). However, instead of trying to force unwilling and profit-focused actors, i.e. the scientific publishers/journals, it may be better to realize that these actors are no longer necessary. They may be challenged by more modern publishing platforms, which are simpler, less expensive and more open, and with adequate quality assurance. By such a

change the scientists will have ownership to the whole research process, from hypothesis/project to publishing.

It is not critical or necessary to await consensus among many or among all interested parties before such a system is implemented, or at least tested. Somebody has to lead the way. The opportunity is up for grabs. Norway could do it. The competences and the resources to establish and service such a system are available. Such a platform could initially and primarily publish research by researchers from Norwegian research institutions.

Publishing scientific reports is an important basis for evaluation of individual and institutional competence and productivity. Publishing in a system like the one outlined here may be easily adapted into such a context. In the beginning, the old/current and the new system may co-exist. With time, the cheaper, simpler, faster, more open, and more functional system will prevail. In line with their support and wish for an open science, responsible authorities/institutions should participate in the funding of such a system, as is also made allowance for in EU’s Plan S (2018).

## The role of journals

An exciting possibility for some of the traditional journals could be to engage in annotated compilations, overviews, summaries, and analyses of different research fields. They would have a large and freely accessible market of scientific reports to choose from. So-called “overlay journals” pick articles from this market already today. Serious, comprehensive and thorough secondary literature of various types is important in our time with fragmentation and specialisation of research. *Ad hoc* groups of researchers may contribute in such projects.

## Concluding remarks

The puzzle of science is huge, unlimited in fact, and both small and large pieces are needed to reveal the big picture. The results of science, big and small, must be disseminated. Both research in the forefront and research picking up loose threads left behind, merit publishing. Only a few basic requirements must be fulfilled by reported research: it must be sound, clear, reproducible, and openly accessible. With full openness in the publication process and with the possibility of being commented after publication, it is secured that the research report is of sufficient quality and that it will attain the importance and position it deserves. It is not easy, and not even necessary, to loosen up what is cemented over years. It may be better to

replace it with something new. It takes courage to do that. Somebody has to start. The researchers and science deserve it ...

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#### Corrigendum

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p. 14, section “An expensive publishing service”, line 3	billions	millions

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